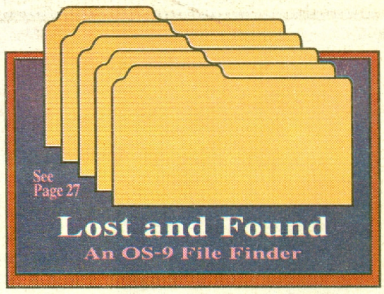
Serving the CoCo Community for
The RAINBOW 11 YEARS
THE COLOR COMPUTER MONTHLY MAGAZINE
March 1992 Vol. XI No. 8 Canada $4.95 U.S. $3.95



Telecommunications

Data Transmission Reaches New Speeds

Several years ago devices such as modems were considered to be expensive tools of magicians and those who practiced the art of computerized black magic. As time went by, the modem made slow gains in general use — while the speed at which data could be transferred increased from 300 to 1200 and finally to 2400 bits per second (roughly equivalent to 30, 120 and 240 characters per second).

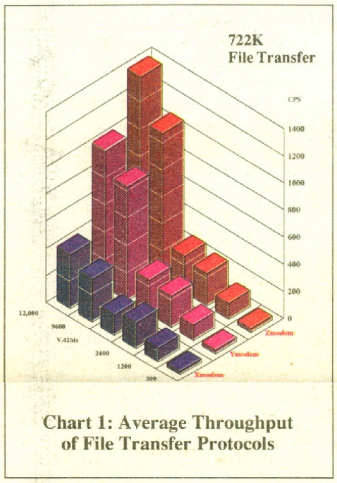


Chart 1: Average Throughput of File Transfer Protocols

In the past two to three years, modems have soared in popularity. Prices have dropped drastically, new online services have been created, most online services have decreased their hourly rates to maintain competitive edges, and BBSs operated mostly by hobbyists have sprung up like wildflowers.

What was once a market reserved for those who could afford it is now teeming with life due in part to the significant cost reduction in both the hardware and the services available. Not long ago bulky 300-bps modems cost well over $300 and were acoustically coupled to the telephone handset. Today the cost of a 2400-bps modem is under $100, 1200-bps modems are available for as little as $20 new — and the prices continue to decrease. And for the speed demon, 9600-bps modems range in price from $400 up while 14,400-bps modems are increasingly available. As this newer breed of modem becomes more popular, expect the prices of the older-technology modems to fall.

What Is a Modem?

A modem is a device that acts as a translator between a computer and the telephone system. Its main task is converting the computer's digital signals into the modulated analog signals used by the telephone system and visa versa for signals traveling from the telephone system to the computer. The key word here is *modulation*. Modulation of the digital signals is necessary because the telephone system is designed to carry the human voice, which generates sounds between 300 and 3000 Hz. The term *modem* is thus derived from the terms *mo*dulate and *demo*dulate.

The modem plays a crucial role in getting data transferred from one computer to another. A poor-quality connection is typically the death of telecommunications — even the sporadic crackle and pop can translate into an enormous amount of "garbage" appearing on the screen. Advances in modem technology coupled with advances in the telephone systems have helped bring about clearer connections with much less worry about noise interrupting our conversations.

Even with the technological advances of the last decade, it is the telephone system that limits the speed at which data can be transmitted. This is because the intent of the telephone system is to transmit reliable voice communications from one location to the next. As modem technology advanced, better noise filters were developed that could effectively eliminate noise from interfering with the transmission of data. Unfortunately, however, situations arise in which noise filters simply cannot totally eliminate noise. This led to the development of error-correction protocols.

See New Speeds on Page 16

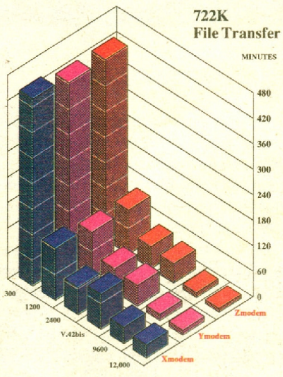


Chart 2: Download Time in Minutes

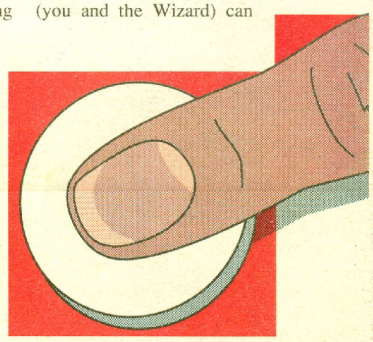
Feature Program

The Wizard Puts a Hex on Checkers

The Wizard is a game that tests your ability to plan ahead. After you run this CoCo 1, 2 or 3 game, a checkers playing board appears onscreen. While *The Wizard* is played much like checkers, the object of the game is slightly different: You must keep the Wizard's men (your computerized opponents) from capturing your castle (the bottom two rows of the board).

The Wizard, whose men start at the top of the screen, moves first. When it is your turn, a small green dot appears on the screen. Use the right or left arrow to move the green dot so it is on the same square as the man you want to move, then press ENTER to select that man. Now press either the right or left arrow — the man will be moved diagonally to the right or left accordingly. When selecting a man to move, make sure the piece can legally be moved — no error checking is performed and you'll have to start the game over if you select an unmovable piece.

As with checkers, both players (you and the Wizard) can move only diagonally and to open squares. However, you may jump over a Wizard's man, capturing that piece.



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Editor and Publisher Lawrence C. Falk
Managing Editor Cray Augsburg
Associate Editor Sue Fomby
Submissions/Reviews Editor Tony Olive
Technical Editor Greg Law
Technical Assistants Ed Ellers, Gregory Shultz
Editorial Assistant Julie Hutchinson
Contributing Editors Tony DiStefano, Martin Goodman, M.D., Eddie Kuns
Art Director Heidi Nelson
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Consulting Editors Judi Hutchinson, Laurie D. Falk
Typesetter Debbee Diamond

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Advertising Representatives Belinda Kirby, Kim Lewis
Advertising Assistant Carolyn Fenwick
(502)228-4492

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A New World

This month's issue of THE RAINBOW marks a new era for our favorite CoCo publication (in fact, for the second-oldest continuously-published computer periodical we know of — *Byte* is older). As you have no doubt already noticed, we have changed our format from a "slick" standard-sized magazine to a "tabloid" format. Interestingly, this marks the fourth time we have changed formats in our publishing history. And, as in every case in the past, there are pros and cons.

Originally conceived as a newsletter, the first RAINBOWs were printed on dot-matrix printers, photocopied, stapled in one corner, folded over and mailed. Of course we changed things many times from the initial issue in July 1981. But essentially that was the "look" THE RAINBOW had up until its first major change in January 1982, when we went to "professional printing."

At that point we stapled a cover around what we considered had evolved into a magazine, used a heavier paper stock for the cover, and changed the way we did a lot of things inside. We still had dot-maxtrix copy; but during this period we added color, tried several different types of paper, and began using a different kind of printer — all of which made the actual composition of the magazine vastly different for us.

In July 1982, we went "slick" with the kind of four-color cover, shiny paper and typeset copy you are used to seeing. We thought it was a great step forward and many agreed; but many disagreed as well. We got quite a number of letters asking us not to use slick paper, asking us to continue to print editorial material on the cover, and so on.

Many changes came to THE RAINBOW during this time. We switched to perfect binding, started using four-color process for editorial and ended up with our own in-house typesetting operation. The latter progressed into a full-fledged prepress setup which remains the heart of our production facilities today.

While all of this was happening, the Color Computer had its ups and downs (mostly ups) with the introduction of the Color Computer 2, OS-9 from Radio Shack, the CoCo 3 and lots and lots of other things. Then about two years ago Radio Shack discontinued manufacturing the Color Computer.

The CoCo still lives; and it lives happily. With millions of CoCos in the hands of people like you, the market for software and hardware continues to exist. And not a day has gone by in nine years that we have not gotten at least one *new* subscriber to THE RAINBOW.

No, the market is not as robust as in CoCo's heyday and never will be again. Yet I continue to maintain, along with thousands and thousands of people like you, that the CoCo is in many ways an ideal home computer (IBM and Tandy itself notwithstanding), and I believe it will continue to be for a long time to come. With no other system, at lower cost, do you see the ability, the speed, and the variety of opportunities and availabilities the Color Computer offers you.

As I am sure most of you who read this space have seen at one time or another, magazine size is totally advertising-driven. This means that how much space we can use each month for editorial material is dependent on the amount of advertising space we sell.

This of course is why we always ask you to patronize our advertisers. As they do well, they advertise a little more, and we end up with more space for editorial use — more programs, hints, tips, columns and the like.

Also (of course) advertising is circulation-driven, which means that advertisers want their message to reach as many people for whom they have something to sell as possible. This is why we urge you to support us with your subscriptions, too, and to encourage others to subscribe.

When we were in a battle for survival with a number of other magazines in the CoCo market, we continued to grow and expand while the others fell by the wayside. The "rap" against THE RAINBOW that these other magazines always made was that they were "professional publishers" while we were sort of "hillbillies in Kentucky who don't know what they are doing."

But the "hillbillies" developed their own prepress operation rather than farming it out, did their own subscription fulfillment instead of hiring someone in Colorado, sold their own ads, and so on. We practiced economies that the publishing giants we were up against — Ziff-Davis and International Data Group — just could not do. And we do them still today.

We have been publishing THE RAINBOW at a loss for some time, primarily due to the expected declines in our advertising and subscription bases. We can still publish for a whole lot less than just about anyone, but now we need to make some changes; and THE RAINBOW you hold in your hands represents those changes.

What have we done with THE RAINBOW? Obviously we have gone to a tabloid format. And, agreed, it looks a little different. But we have also increased our editorial/advertising space by almost 9 percent simply by virtue of the increased size of the pages. This means you're getting more information in the issue you hold in your hands than you did from the one you got last month.

We have increased the potential for editorial color by using what is called *spot color* as opposed to costly *four-color process* color in the majority of the magazine (but the cover page remains four-color). If we want the printer to print red, we tell him to "print red here" and he loads up his press with red ink. With the four-color process, he has to "make" red by combining two different inks; and we have to have them available on every page on which we want to put red.

We are giving our advertisers more space to showcase their products at no increase in cost; simply put, the ads are bigger as the page size increases. This also means we can offer some less-expensive "beginner" advertisments for people with new programs and new ideas. If such products are successful, our revenue grows. And the number of pages will then grow, too.

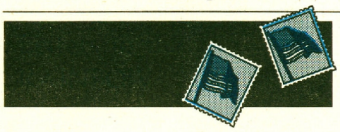
Needless to say, the changes we are making result in savings (obviously!) in the cost of paper and printing. We are directing these savings into editorial support for the magazine.

Speaking of editorial support, we will begin leaning more and more toward fundamentals: the basic Color Computer and OS-9. We felt the new computers, which we featured on three covers last year, deserved your consideration. But the vast majority of CoCo users want information about their CoCos. That's what we will do.

In "Fiddler on the Roof," when Tevya the Milkman was trying to convince Golda it was all right for their daughter, Seitel, to marry Motel the Tailor just because she loved him, he told her: "It's a new world, Golda." Within a year or so, Motel bought a new invention (a sewing machine); Seitel was expecting Tevya's first grandchild; and though there were travails, the family ended up moving from an "overworked, tumbledown village" in heartless Russia to Chicago. And there they lived happily ever after.

It's a new world at THE RAINBOW, too. I think with these changes — *and your support* — we of the CoCo Community, like Tevya, will live happily ever after.

— Lonnie Falk



MS-DOS vs. OS-9

Editor:

As a long-time CoCoer and CoCo loyalist, I must say that I've never seen the CoCo world in a more naive or idealistic state. In ads in this very publication, I see references to MS-DOS such as "works like the famous MS-DOS program."

I am a satisfied user of MS-DOS, various software packages, various hardware aspects, and even such obscure topics as advanced batch processing and assembly language. I make and sell PC-compatible computers and even own and operate three PC-compatibles. However, I have something to say that hopefully will open the eyes of many CoCo users who are ready to buy into the unrealistic MS-DOS ideal that exists in the CoCo world.

OS-9 is better than MS-DOS. It's as simple as that. While the two work almost exactly the same in most respects, OS-9 has more features — pound per pound, inch by inch. OS-9 beats MS-DOS in speed (see how fast MS-DOS runs on a 2-MHz machine), capability (MS-DOS is not modular), and just about any other aspect you can think of.

Many CoCoers hope to escape the drudgery of learning OS-9 by moving to MS-DOS. For those of you thinking of taking this route — it's not possible. Disk BASIC is the last of the orphan BASIC operating systems. OS-9 and MS-DOS are in the same category — and they function almost alike (from the simplest `dir` command all the way to batch processing, full pathnames and redirection symbols.

CoCoers, wake up and smell the roses that exist right under your nose . . . and use OS-9.

Aron Hsiao
1470 West Stetson Circle
Salt Lake City, UT 84104

And Again . . .

Editor:

I am writing this letter to thank you for what you are doing for CoCo buffs. My brother-in-law has an 80386-based system and he has it loaded to the hilt with programs. I have *Turbo C* and *Turbo Pascal* by Borland, which I use, but my true love is my CoCo.

I do not have a hard drive for my CoCo; and since I am out of work, I can't afford Delphi, although I wish I could. I even wish I could afford a bigger and better CoCo. I think most CoCo buffs really do prefer CoCos over PC-compatibles. And just think, if CoCo buffs worldwide sold to each other, we all would be doing better.

It is good to see what else is available in computers for us. But before we buy, we may want a system that is going to be backed up by a magazine. Perhaps you should decide what would be best for the CoCo community as a future computer, so the CoCo community can develop software for it. Then, if we want a multi-user network, we could do it on our own. We CoCo buffs could eventually set up our own computer network and go from there.

The future is here, so don't give up the ship.

J. Lee Smith
1050 State Street
Vermilion, OH 44089

While we can publish information for just about any system we choose, the CoCo Community has been established for some time. It would be suicide to pick just one of the new machines, cutting off support for the others and the CoCo (which is the reason we are here in the first place). We cannot decide what is best; only you can do that. The software will follow. And we are here to support the community in the directions it takes.

Transferring Files

Editor:

Since I started using the CoCo, I have been purchasing back issues of THE RAINBOW as I could afford them. I would like to recommend two issues (June and July 1986) to all those who are thinking of changing to a "better" machine. These two issues contain articles for transferring ASCII files to MS-DOS and back again. I have used the programs both ways between my CoCo and a friend's IBM machine. It sure saves a lot of typing if you are sending already stored files, or if you are transferring your own files to your PC.

A lot of people are impressed that our little machine can do this.

John A. Coldwell
c/o Bag 3670
Prince Rupert, BC V8J 3R1
Canada

More on Transfers

Editor:

Is there any possible way we can use our CoCo 3 disks in a PC-compatible computer? We want to keep our CoCo, but we also have a Headstart Explorer that we would like to transfer our CoCo 3 disks to. Any chance of doing this?

Susan Stutzman
624 Lincolnway East
Goshen, IN 46526

Several file-transfer utilities are available from a number of sources. GCS File Transfer Utilities *from Granite Computer Systems (603-464-3850) runs under OS-9 and can transfer files between OS-9, MS-DOS, Disk* BASIC *and Flex operating systems.* Elite*Xfer, *available from Elite Software (800-745-8491), runs under MS-DOS and transfers files between MS-DOS and Disk* BASIC, *and can also translate* Elite*Word *files to ASCII format.*

Black-and-White Colors

Editor:

My sister and I both have CoCo 3's with CM-8 monitors, and we are not sure if we are having a problem or not. With the PALETTE RGB command, some of our software (for instance, *DeskMate*) comes up in black and white on the monitor and in color when connected to a TV. What is going on?

I would like to thank the people at Zebra Systems for their help. My sister bought *CoCo Graphics Designer Plus* and there wasn't a setting for her DMP-107 printer. We wrote to Zebra Systems and a week later came the answer to use the DMP-130 setting.

Frank Barry
5889 Snowdrop Way
West Palm Beach, FL 33417

Pre-CoCo 3 software often took advantage of a problem with TVs and color composite monitors that allowed them to display artifact (false) colors. The effect of color was achieved by drawing black lines in certain screen locations. Being more precise, the CM-8 and other RGB monitors display the information exactly as it is sent — in black and white. This is not a problem with your monitor or *the software.*

Amateur Radio Software

Editor:

I just received six sides of public domain amateur radio software from radio operator Dave Johnstone (WB1COB) on the condition that I spread it around to hams everywhere. He says it's from the American Radio Relay League's old PX department listings that were available to anyone with the time to enter the listings. All the classics are included.

You are always printing letters from hams looking for software for our versatile computer. Any ham who sends me enough disks and a self-addressed, stamped disk mailer is welcome to this software.

Keep the CoCo alive!

Charles Scanlon
2 Eagle Lane
Simsbury, CT 06070

Compiler References

Editor:

I have been a subscriber to THE RAINBOW for about two years and I have found a lot of useful information in the articles. I have recently been able to purchase the Pascal and C compilers and the *OS-9 Development System* at a very reasonable price. Can you recommend or do you have any reference manuals for these?

I am purchasing the *Complete Rainbow Guide to OS-9*. I am currently using OS-9 Level II. Can you recommend any other reference material for this system and where I may be able to obtain it?

Samuel W. McGregor
4213 Trough Springs Road
Adams, IN 37010

The C compiler for OS-9 follows the older Kernighan and Ritchie standard, so any book based on that standard will help you learn how to program in C. The primary reference for the C language is The C Programming Language, First Edition *by Kernighan and Ritchie. This book was updated a few years ago and* The C Programming Language, Second Edition *covers the newer ANSI standard.*

Installing Additional Drives

Editor:

I have a technical question that I can't seem to get answered from my Radio Shack dealer or local CoCoists. I obtained a TRS-80 Mini Drive (Catalog No. 26-1160) in the old gray case and want to see if I can dismantle it and use the drive as Drive 1 in my FD-502. Can I do this? Although the older drive has the lock in the middle and the FD-502 has a lever lock, I believe the old drive will mount in the case perfectly.

Where can I purchase reversible 5¼-inch disks? I can't find a supplier. Also I read quite a bit about BBSs. In the near future I plan to add a modem, but for the time being is it possible to get some of the freeware offered on BBSs for my use now?

Thank you for any help you can give, and keep up the excellent work with THE RAINBOW. Without it I'd be lost, and I'm sure other CoCo Nuts would say the same thing.

Dann McConnell
613 West Park
Kellogg, ID 83837

You should be able to use the drive with your CoCo system. See "Disk Drives and the CoCo" in the March and April 1990 issues of THE RAINBOW *for more information. You can get reversible ("flippy") disks from BASF Corporation Information Systems (Crosby Drive, Bedford, MA 01730-1471); ask for Part #54337.*

In Search of Compilers

Editor:

I have had a CoCo since December 1982. I am looking for a C compiler for Disk BASIC. I have a C and Pascal compiler for OS-9, but I need the stand-alone ability with Disk BASIC. I am currently using Deft Pascal Version 4.1, but I need something more flexible.

Does anybody know of a C compiler for Disk BASIC? Years ago there was one sold by Duggers Growing Systems and I've heard rumors of a Small C port, but I haven't been able to find either one.

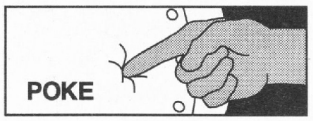
And does anyone know where I could obtain information on the internal workings of OS-9 Level II?

Carey Bloodworth
1601 North Hills Boulevard
Van Bure, AR 72956

Frank Hogg Laboratory used to sell a book titled Inside OS-9 Level II *written by Kevin Darling that covers the inner workings of OS-9 Level II. Although FHL is no longer selling this book, we have heard that CoCoPRO! may start selling it in the near future.*

THE RAINBOW welcomes letters to the editor. Mail should be addressed to: Letters to Rainbow, The Falsoft Building, 9509 U.S. Hwy 42, P.O. Box 385, Prospect, KY 40059. Letters should include the writer's full name and address. Letters may be edited for clarity or to conserve space.

Letters to the editor may also be sent to us through our Delphi CoCo SIG. From the CoCo SIG> prompt, enter RAI to get to the Rainbow Magazine Services area of the SIG. At the RAINBOW> prompt, enter LET to reach the LETTERS> prompt, then select Letters for Publication. Be sure to include your complete name and address.



When it is encountered in a BASIC program, one of the first things the CoCo 3 HSCREEN command does is erase the contents of the Hi-Res graphics screen. This can be a real troublemaker for programs designed to go back and forth between text and graphics so the user can add new details to the image. To eliminate this automatic HCLS, use

```
POKE &HE6C6,18:POKE &HE6C7,18
```

Art Sale!
All your favorite clipart collections are ON SALE thru April 15th!
Art Deli 440 professionally-drawn PMODE4 clipart pix on 10 double-sided diskettes, covering subjects such as holidays, people, travel, patriotic, seasons, food, and more! Import these into CoCoMax, Max-10, or other programs, and add style to your work! Req. double-sided drive.
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Pen Pals

✍ I have a CoCo 3, two disk drives and a DMP-107. I've been a RAINBOW subscriber for about four months, although I've had my CoCo for a year. I would like to correspond with someone 25 or older who can enlighten me in the area of programming. I'd also like to be part of a club. Please contact me if you know of a club in my area.

Marianne Clark
1504 E. Pierce
Macomb, IL 61455

✍ I'm 13 years old and have a CoCo 3, a CoCo 2, a CCR-81 recorder and various software packages. I'm hoping to get a disk drive soon. I am looking for a pen pal anywhere in the world, but especially in Montana. I will try to reply to all who write me.

Josh Plum
P.O. Box 354
Seeley Lake, MT 59868

✍ I'm 18 years old and would like a pen pal my own age with whom to share ideas and information. I do most all of my computing on a 512K CoCo 3 with a Magnavox 1CM135 RGB monitor, an FD-502 disk drive, a DMP-132 and a DWP-230. I use *Word Power 3.3* for word processing and *CoCo Graphics Designer Plus* for banners, signs, etc. I am also interested in music, especially by Led Zeppelin. I will answer all letters. If there is anyone in the Grand Ledge, Mulliken, Portand or Charlotte (Michigan) area who owns a CoCo and has similar interests, please write.

Jerry Leik
P.O. Box 125
Mulliken, MI 48861

✍ I am 19 years old and speak Spanish, German and English. I have a 64K CoCo 1 disk system and I'm interested in exchanging letters and PMODE 4 graphics. I would be very glad to receive letters from all over the United States. I'll do my best to respond to all letters.

Daniel Streidt
Wurzburger St. 73
8750 Aschaffenburg
Germany

✍ I would like someone who knows how to use OS-9/*Multi-Vue* to help me learn more about loading projects into the environment.

Ray H. Baumiller Jr.
604 S. Richard St.
Bedford, PA 15522

CoCo Clubs

ARIZONA

☎ Tucson Color Computer Club, Bruce Smith, 3030 Mustang Drive, Tucson, 85708, (602) 747-7859

CALIFORNIA

☎ Citrus Color Computer Club, Orville Beaver, P.O. Box 6991, San Bernardino, 92412-6991, (714) 685-6334

☎ Color America Users Group, Jack W. Eizenga, 3811 N. Foster Ave., Baldwin Park, 91706-3912, (818) 960-8010

☎ Marysville\Yuba City Area CoCo Club, Jim Vestal, P.O. Box 5126, Marysville, 95901, (916) 742-5499

COLORADO

☎ Colorado Springs Color Computer Club, Bud Ward, 1118 Claiborne Road, Colorado Springs, 80906-5513, (719) 392-8268

CONNECTICUT

☎ Connecticut CoConut Connection, Charles Joseph Scanlon, 2 Eagle Lane, Simsbury, 06070, (203) 657-8373

FLORIDA

☎ The Color Computer 3 Users Group, Tom Batchelder, 6042 Syrcle Ave., Milton, 32570, (904) 623-4405

GEORGIA

☎ Atlanta Computer Society, Inc., Alan R. Dages, 4290 Bells Ferry Road Suite 10639, Kennesaw, 30144, (404) 469-5111 voice, (404) 636-2991 modem

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☎ Snake River Color Computer Club, Emil Franklin, 1750 Carmel Drive, Idaho Falls, 83403, (208) 522-0220

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☎ Chicago OS-9 Users Group, Howard Lucky, 10 McCarthy Road, Park Forest, 60466-2122, (708) 747-0117

☎ Glenside Color Computer Club, Tony Podraza, 119 Adobe Circle, Carpentersville, 60110, (708) 428-3576

☎ The Sterling Computer Users Group, c/o Greg Adams, 224 Park Drive, Sterling, 61081-3033, (815) 626-7140

IOWA

☎ Metro Area Color Computer Club, Joe Cavallaro, 2425 Ave A, Co. Bluffs, 51501, (712) 322-2438

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☎ Hardin County Color Computer Club, Paul Urbahns, 2887 Republic Ave., Radcliff, 40160, (502) 351-4757

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☎ The CoCo SIG, Christopher Mayeux, 20 Gibbs Drive, Chalmette, 70043, (504) 277-6880 voice, (504) 277-5135 modem

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☎ Arkade, John M. Beck, 3513 Terrace Drive #D, Suitland, 20746, (301) 423-8418

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☎ NorthEast CoCo Club, Jose Joubert, 440 North Ave., Bldg. 9 #210, Haverhill, 01830, (508) 521-0164

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☎ Greater Lansing Color Computer Users Group, E. Dale Knepper, P.O. Box 14114, Lansing, 48901, (517) 626-6917

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☎ Central Mississippi Color Computer Society, Boisy G. Pitre, 6011 I-55 North, Jackson, 39213, (601) 956-9377

MISSOURI

☎ CoCoNuts User Group, Clyde Lloyd, 2116 N. Columbia, Springfield, 65803, (417) 866-8738

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☎ Bruce Gerst c/o Metro Area CoCo Club, P.O. Box 3422, Omaha, 68103

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☎ The Island CoCo Club, Dennis Zobel, P.O. Box 426, Massapequa, 11762

☎ Kings Byte CoCo Club, Morty Libowitz, 1063 E. 84th St., Brooklyn, 11236, (718) 763-4233

☎ Twin Tiers CoCo Club, William Cecchini, 319 Irvine Place, Elmira, 14901, (607) 734-0065

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☎ Raleigh CoCo Club, P.O. Box 10632, Raleigh, 27605, (919) 878-3865

☎ The Tandy Color Computer Users of Charlotte, Eric Stringer, 1022 Noles Dr., Mt. Holly, 28120

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☎ Dayton Color Computer Users Group, Steve E. Lewis, 4230 Cordell Drive, Dayton, 45439, (513) 299-3060

☎ The Greater Toledo Color Computer Club, Bill Espen, 1319 North St., Bowling Green, 43402, (419) 471-9444

☎ Tri-County Computer Users Group, Ron Potter, 10914 Oliver Road, Cleveland, 44111, (216) 476-2687

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☎ Johnstown Area Color Computer Users Group, Albert Baldish, 111 C St. Apt #1, Johnstown, 15906, (814)535-1497

☎ Pittsburgh Color Group, Ralph Marting, 309 Frazier Drive, Pittsburgh, 15235, (412) 823-7607

RHODE ISLAND

☎ New England "CoCoNuts" Color Computer Club, Arthur J. Mendonca, P.O. Box 28106 North Station, Providence, 02908, (401) 272-5096 (Sig3)

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☎ Spartanburg CoCo Club, Jesse W. Parris, 152 Bon Air Ave., Spartanburg, 29303, (803) 573-9881

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☎ Empire Area Color Computer Users Group of South Dakota, Carl Holt, P.O. Box 395, Brandon, 57005, (605) 582-3862

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☎ The Codis CoCo Symphony, William C. Garretson, 2902 Harvard St., Irving, 75062, (214) 570-0823

☎ Mid Cities TRS-80 Users Group, Rob Yoder, P.O. Box 171566, Arlington, 76003, (817) 535-7931

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☎ Salt City CoCo Club, L. Todd Knudsen, 6357 S. Lotus Way, West Jordan, 84084, (801) 968-8668

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☎ Richmond Area Color Computer Organization, William T. Mays Jr., 6003 Westbourne Drive, Richmond, 23230, (804) 282-7778

☎ Southwestern Virginia Color Computer Club, Ricky Sutphin, Route 1 Box 20, Henry, 24102, (703) 365-2018

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☎ Bellingham OS-9 Users Group, Rodger Alexander, 3404 Illinois Lane, Bellingham, 98226, (206) 734-5806

☎ Port O' CoCo, Donald Zimmerman, 3046 Banner Rd. SE, Port Orchard, 98366-8810, (206) 871-6535

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☎ Australian National OS-9 Users Group, Gordon Bentzen, C/- 8 Odin Street, Sunnybank, Queensland, 4109, (07) 344-3881

☎ Brisbane Southwest Colour Computer Users Group, Bob Devries, 21 Virgo St., Inala, Queensland, 4077, (07) 372-7816

CANADA

☎ Le Club D'Oridinateur Couleur du Quebec Inc., 8000 Boul. Metropolitain, Ville d'Anjou, Quebec, H1K 1A1, (514) 354-4941

☎ The Edmonton CoCo Users Group, Lloyd Folden, 13208-128 Avenue, Edmonton, Alberta, T5L 3H2, (403) 426-1888

GERMANY

☎ OS-9 Users Group in Europe, Burghard Kinzel, Leipziger Ring 22A, 5042 ERFTSTADT, +49-2235-41069, (OS-9/6809)

THE NETHERLANDS

☎ European OS-9 User Group, Peter Tutelaers, Strijperstraat 50A, 5595 GD Leende, s88405777@hsepml.hse.nl, +31-4906-1971, (OSK)

PUERTO RICO

☎ Puerto Rico Color Computer Club, Luis R. Martinez, P.O. Box 2072, Guaynabo, 00657-7004, (809) 799-8217 or (809) 728-2314

Bulletin Board Systems

State/City	BBS Name	Access Number	Parameters (Speed-Parity-Word Bits-Stop Bits)	SysOp
Arkansas				
Jonesboro	The 8-Bit Wonderland	(501) 931-9528	300/1200/2400-N-8-1	Mike Smith
Sheridan	The Grant County BBS	(501) 942-4047	300/1200/2400-N-8-1	Eddie Gilmore
California				
Canoga Park	Dune [1]	(818) 992-4279	300/1200/2400-N-8-1	Leonard Cassady(Maudib)
Hollywood	Zog's Cavern BBS	(213) 461-7948	300/1200/2400-N-8-1	Alan Sheltra
Laguna Hills	Rainbow Connection	(714) 831-6530 Info Service	300/1200/2400-N-8-1	Eric Levinson
Marysville	09-Online BBS	(916) 742-6809	300/1200-N-8-1	Jim Vestal
Northridge	Plain Rap BBS [2]	(818) 772-8890	300/1200/2400-N-8-1	Jim Sutemeier
Colorado				
Colorado Springs	The Time Safari	(719) 635-7228	300/1200-N-8-1	David Vallier
Connecticut				
Manchester	Silk City BBS	(203) 649-9057	300/1200/2400-N-8-1	Darren Kindberg
Waterbury	Applause BBS	(203) 754-9598	300/1200/2400-N-8-1	Carmen Izzi, Jr.
Florida				
Cocoa Beach	KB Enterprises' CEBBS [3]	(407) 799-3282	300/1200-N-8-1	Kevin Berner
Miami	A Little R S R	(305)266-1099	300/1200-N-8-1	Robert Jones/Robert Caraballo
Hawaii				
Ft. Shafter	CoCo'Nuts BBS Service	(808) 845-7054	300/1200/2400-N-8-1	Tommie Taylor
Illinois				
Carpentersville	The Pinball Haven BBS	(708) 428-8445	300/1200/2400-N-8-1	Jeffrey R. Chapin
La Grange Park	S & V BBS	(708) 352-0948	300/1200/2400-N-8-1	Paul Jerkatis
Kansas				
Beloit	Kansas Konnektion BBS	(913) 738-5613	300/1200-N-8-1	Gary N. McCarty
Kentucky				
Elkhorn City	Cross-N-Crown BBS	(606) 754-9420	300/2400-N-8-1	Tim McIntosh
Louisiana				
Harvey	The Node 3	(504) 347-4320	300/2400-N-8-1	Gene Clifton
Michigan				
Manistee	Crystal Palace	(616) 723-0146	1200/2400-N-8-1	Nelson Howard
Lansing	Benchboard BBS	(517) 394-2447	300/1200/2400-N-8-1	John Evans
Taylor	J & L's CoCo Corner	(313) 292-4713	300/1200/2400-N-8-1	Jim Snider
Minnesota				
Brainerd	Brainerd 4-Way [4]	(218)828-1144	300/1200/2400-N-8-1	Mike Lowe
New Hampshire				
Allenstown	The CoCoBean BBS	(603)485-8682	300/1200/2400-N-8-1	David Bean
New Jersey				
High Bridge	Hilltop BBS	(201)638-5698	300/1200/2400-N-8-1	Guy Silliman
Mercerville	TAO BBS	(609)587-2672	300/1200/2400-N-8-1	Bob Watson
New York				
Wappingers Falls	The Dutchess CoCo	(914) 838-1261	300/1200/2400-N-8-1	Chris Serino
North Carolina				
Concord	The Stargate BBS	(704) 788-7867	300/1200/2400-N-8-1	Jim Brock
Wilmington	Bill's Board	(919) 395-4366	300/1200/2400-N-8-1	Bill Medcalf
North Dakota				
Minot AFB	The 9-Line BBS	(701) 727-6826	300/1200-N-8-1	David Hensley
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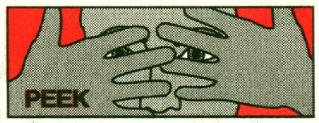
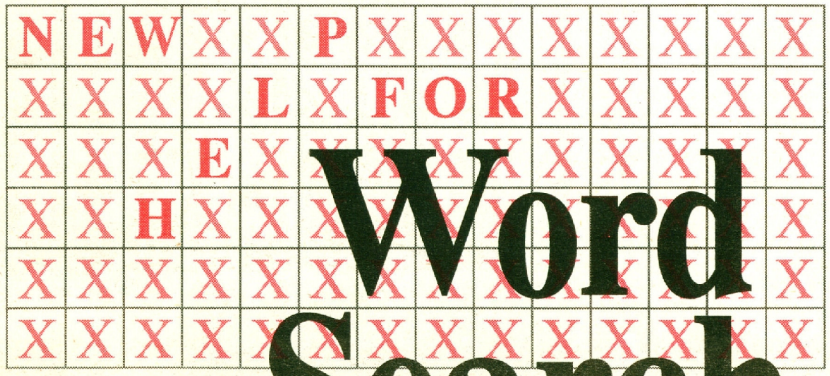
State/City	BBS Name	Access Number	Parameters (Speed-Parity-Word Bits-Stop Bits)	SysOp
Reynoldsburg	East Side Connection CEBBS	(614) 755-2492	300/1200/2400-N-8-1	John L. Wilkerson
Oklahoma				
Tecumseh	Pat BBS [5]	(405) 598-5082	300-N-8-1	Pat Aldridge
Pennsylvania				
Palmer	ASCII =80=	(215)252-1608	300/1200/2400-E-7-1	Nevin Keller
Rhode Island				
Central Falls	The Weather Connection II BBS	(401) 728-8709	300/1200/2400-N-8-1	Eric Chew
Virginia				
Fall Mills	Clem's Corner BBS [6]	(703) 322-4053	300/1200-N-8-1	Richard Douglas Bailey
Richmond	Tree House BBS	(804) 744-0157	300/1200/2400-N-8-1	Doug James
Wisconsin				
Marinette	Phoenix Interstate [7]	(715) 732-1036 Data Systems	300/1200/2400/9600-N-8-1	Joe Boburka
Canada				
Lunenburg, N.S.	Color Nova BBS	(902) 634-3095	300/1200/2400-N-8-1	John D. Cleveland
Cornwall, Ontario	4C's BBS	(613) 936-0823	300/1200/2400-N-8-1	Mike Lebrun
Twillingate, NF,	ColorNET BBS	(709) 884-2176	300-N-8-1	Jason Woodford

Notes:
[1]Dune supports OS9/OSK and is part of StG NET International node.
[2]Plain Rap BBS OSK/OS9, RS-DOS supported. Part of the StG Network.
[3]KB Enterprises' CEBBS is up from 5 p.m. to 9 a.m. (EST) seven days a week.
[4]Brainerd 4-Way is up from 8 p.m. Saturday to 5 p.m. Friday.
[5]Pat BBS is up 5 p.m. to 9 p.m. weekdays and 10 a.m. to 10 p.m. weekends. This new BBS is counting on you for uploads.
[6]Clem's Corner BBS is up from 6 p.m. to 11 p.m. seven days a week.
[7]Phoenix Interstate Data Systems has a .75/hr charge for premium services, paid in advance.



When writing a program that others will use, it is important to design the program (where possible) so it knows whether the other systems are tape-based or use a disk drive. In BASIC, you can use PEEK(188) to get this information. If the value returned is 6, the system is tape-based. But if the value returned is 14, a disk drive has been detected. Your program can then proceed accordingly.

Feature Program



Word Search

If you work word-search puzzles often, you no doubt have come across puzzles that are very difficult to solve — some words just seem to want to stay hidden. I wrote *WordFind* to end the frustration of hour-long searches. *WordFind* is a CoCo 3 program that can find words in puzzles with up to 21 lines and 70 characters in each line. Of course it's cheating, but preventing a headache is sometimes more important.

To use *WordFind*, enter the program as shown in the listing and save it to disk or tape. (The program uses the high-speed poke so be sure to enter it completely and save it before running it.) Before running the program, you must enter the puzzle you want *WordFind* to search. Do this by editing and adding DATA statements in lines 30 though 99. Each line in the word-search puzzle is represented by one data item, and all the characters in the line are entered without spaces between them. All lines should be entered using uppercase characters. Since *WordFind* comes with a sample word puzzle, you can look at Line 30 to see how it is done. Be careful when entering the lines — if you make a typing mistake, *WordFind* may not be able to find the words for you.

After you have entered the puzzle, run the program and you are greeted by a title screen. When the screen clears, *WordFind* tells you how many lines are in the puzzle. When you press a key, the program prompts you to enter the word you want it to find. *WordFind* then goes to work, searching through the puzzle for your word. (Larger puzzles may take some time, so please be patient.)

If the computer doesn't find the word you want, it tells you. If the computer does find the word, it changes the word to lowercase characters and flashes it onscreen in the correct position in the puzzle. At this point, press any key to return and enter another word, or press BREAK to exit the program.

Brad Renfro has won regional awards for programming as a member of his school's computer team. He has been programming for seven years and is now learning assembly language and Pascal.

CoCo 3

The Listing: WORDFIND

```
1 'WORD FINDER
2 'BY BRAD RENFRO
3 'COPYRIGHT (C) 1992
4 'BY FALSOFT, INC.
5 'RAINBOW MAGAZINE
6 WIDTH 80:ATTR2,4:CLS:RESTORE
10 ON ERR GOTO 465
15 ON BRK GOTO 450
20 'WORDS IN THE EXAMPLE PUZZLE
ARE AS FOLLOWED:1.WORDFINDER 2.R
AINBOW 3.COCO 4.RGB 5.CMP
25 'THIS PROGRAM HELPS YOU FIND
WORDS IN WORD SEARCH PUZZLE. THI
S PROGRAM WILL HOLD A PUZZLE WIT
H 21 LINES AND 70 LETTERS IN EAC
H LINE.
26 'LINES 30-99 SHOULD GIVE YOU
ENOUGH ROOM TO PLACE EACH LINE I
N DATA STATEMENTS. IF YOU DON'T
HAVE ENOUGH ROOM YOU CAN USE THE
 'RENUM' COMMAND TO MAKE MORE RO
OM.
30 DATA WORDFINDERRD,ETEADETPFPR
V,COCOIZXCBNMA,RGBFDNCMPUTR,DERD
CDBCERTY,DQWPOCVOPUYR,QAZWSXEDWU
IP
100 CLS
105 LOCATE 0,5
110 PRINTTAB(34)"Word Finder":PR
INT
115 PRINT TAB(33)"By Brad Renfro
":PRINT
120 PRINT TAB(31)"Copyright (C)
1989":PRINT:PRINT:PRINT
125 'CHECK FOR NUMBER OF LINES I
N PUZZLE AND CHECK EACH LINE TO
MAKE SURE IT HAS THE SAME NUMBER
 OF LETTERS
130 L=1:ON ERR GOTO 155
135 READ A$:IF L=1 THEN NO=LEN(A
$) ELSE NP=LEN(A$)
140 IF L>1 AND NO<>NP THEN GOTO
455
145 IF NO>70 THEN 470 ELSE IF NP
>70 THEN 470
150 L=L+1:GOTO 135
155 RESTORE:L=L-1:IF L<=0 OR L>2
1 THEN 460
160 ON ERR GOTO 465
165 PRINT TAB(26)"Number of Line
s in Puzzle:"L
170 LOCATE 26,21:PRINT"Press any
 key to continue...";:EXEC44539
175 DIM A$(L+1)
180 FOR I=1TOL
185 READ A$(I):NEXT
190 CLS
195 GOSUB 435
200 PRINT
205 PRINT"Press <Break> to End":
PRINT"What Word will I find?";:L
INEINPUTW$
210 IF W$="" THEN 190
215 POKE 65497,0
220 S=LEN(W$):F$=LEFT$(W$,1)
225 T$=MID$(W$,2,1)
230 FOR Y=1 TO L
235 FOR X=1 TO LEN(A$(Y))
240 G$=MID$(A$(Y),X,1)
245 IF G$=F$ THEN 275
250 NEXT X:NEXTY
255 POKE 65496,0
260 PRINT"WORD NOT IN PUZZLE"
265 LOCATE26,23:PRINT"Press any
key to continue...";:ATTR2,4:EXE
C44539:CLS
270 GOTO195
275 SX=X:SY=Y
280 FOR BX=SX-1 TO SX+1
285 FOR BY=SY-1 TO SY+1
290 IF BX<1 OR BX>LEN(A$(BY)) TH
EN 310
295 IF BY<1 OR BY>L THEN 310
300 E$=MID$(A$(BY),BX,1)
305 IF E$=T$ THEN 320
310 NEXT BY:NEXT BX
315 GOTO 250
320 DX=BX-X:DY=BY-Y
325 CX=X:CY=Y
330 FOR I=1 TO S
335 IF CX<1 OR CX>LEN(A$(CY)) TH
EN 310
340 IF CY<1 OR CY>L THEN 310
345 IF MID$(W$,I,1)<>MID$(A$(CY)
,CX,1) THEN 310
350 CX=CX+DX:CY=CY+DY
355 NEXT I
360 POKE65496,0:REM FIND LETTERS
 CORRESPODING TO WORD FOUND AND
MAKE THEM LOWER CASE AND BLINK B
Y DETERMINING IT'S ASCII CODE AN
D ADDING 128 TO THE ATTRIBUTE BY
TE
365 CLS
370 GOSUB 435
375 SX=SX-1:SX=SX*2
380 P=442208+SX+(SY*160)
385 DX=DX*2
390 FOR I=1 TO S
395 SE$=MID$(W$,I,1):SE=ASC(SE$)
+32:LPOKE P,SE:LPOKE P+1,LPEEK(P
+1)+128
400 P=P+DX+(DY*160)
405 NEXT I
410 POKE 65496,0
415 LOCATE 26,23:PRINT"Press any
 key to continue...";
420 EXEC44539
425 GOTO 190
430 END
435 FOR I=1 TO L
440 PRINT A$(I):NEXTI
445 RETURN
450 POKE 65496,0:END
455 CLS:LOCATE 0,5:PRINT:LOCATE
29,5:ATTR2,4,B:PRINT"EACH LINE S
HOULD HAVE":PRINT:PRINT TAB(32)"
THE SAME NUMBER";:ATTR2,4:END
460 CLS:LOCATE 0,5:PRINT:LOCATE
28,5:ATTR2,4,B:PRINT"TOO MANY LI
NES IN PUZZLE":PRINT:PRINT TAB(2
5)"PLEASE TAKE SOME LINES OFF...
.";:ATTR2,4:END
465 CLS:LOCATE 0,5:PRINT:LOCATE
27,5:ATTR2,4,B:PRINT"ERROR DETEC
TED IN PROGRAM":PRINT:PRINT TAB(
27)"PLEASE CORRECT IF POSSIBLE..
":ATTR2,4:END
470 CLS:LOCATE 0,5:PRINT:LOCATE
27,5:ATTR2,4,B:PRINT"YOU HAVE TO
O MANY LETTERS":PRINT:PRINT TAB(
32)"IN EACH LINE...":ATTR2,4:END
```

Hardware Project

Modification Allows Y Cables

Many CoCo users express an interest in using multiple devices with the cartridge port. Because it is so difficult to locate a Multi-Pak Interface, most of these people consider using a Y cable. However, addressing conflicts often stand in the way of using, for example, a Tandy disk controller and a Burke & Burke hard-drive interface on the same cable.

This article describes an extremely simple hardware modification to Tandy disk controllers, allowing them to be used with the Burke & Burke hard-drive interface or other devices on a Y cable. The modification may be useful to those who want to repackage their CoCos in PC cases (the Multi-Pak isn't easily reduced in size) and also to owners of the TC9 from Frank Hogg Laboratories, which uses a Y cable.

Technical Information

Tandy included two special lines in the Color Computer's system bus to make it easy to connect external hardware to the system: the *CTS and the *SCS lines. The *CTS line (Pin 32 on the system bus) is the *cartridge-select*, which becomes active when the CoCo is operating in the ROM mode and is trying to read from a location in the address range $C000 through $FEFF. The *CTS line is commonly used to decode disk-controller and game-cartridge ROMs. The presence of this line allows programmers to create cartridges that use only a ROM, without any extra address-decoding circuitry.

The *SCS line (Pin 36), or *spare cartridge select*, becomes active during any attempt to read from or write to an address in the range $FF40 through $FF5F. The asterisk in front of *CTS and *SCS means that these lines are *active-low* — each line performs its function when the signal on it is Low. In some literature a bar over the name of the line is used to indicate it is active-low.

I doubt Tandy originally envisioned the Color Computer as a machine with several special-purpose hardware devices plugged in — the computer is designed to accept only one cartridge at a time. This attitude carried over to the design of the Color Computer floppy-disk controller: While the disk controller uses only the address space from $FF40 through $FF4F to operate, Tandy did not design it to fully decode the *SCS address space. This leads to address *ghosting* from the $FF50-$FF5F range to the $FF40-$FF4F range — when using a Tandy or compatible disk controller, anything written to address $FF5*x* also appears at address $FF4*x*. Some external hardware devices are designed to use addresses between $FF50 and $FF5F, but they clobber the disk controller when writing data to this range. Herein lies the problem.

To meet the demand for more-complex Color Computer setups, Tandy introduced the Multi-Pak Interface. This device allows expansion of the system in several ways: It buffers the address and data lines, provides extra power for add-on cards, and allows you to switch between up to four different devices that use the same *CTS and *SCS lines. The Multi-Pak solves a lot of problems . . . if you can find one.

Burke & Burke and Y Cables

The current model of the Burke & Burke hard-drive interface uses the *SCS line to decode the address space from $FF50 through $FF5F for I/O. This model (unlike some of the very early production models) also fully decodes the *SCS line so that *it* does not overlap or ghost into the $FF40 through $FF4F range. If the floppy-disk controller for the CoCo was fully decoded for the $FF40-$FF4F address range, it could be used on a Y cable with the Burke & Burke interface, eliminating the need for a Multi-Pak or similar device (e.g., the Howard Medical Slot Pak III). This would be a boon to TC9 owners, those who can't find a Multi-Pak interface, and those who want to repackage their CoCos in different cases. (Though I use the Burke & Burke hard-drive interface as an example, other devices could compete with the Tandy disk controller for the *SCS space if used together on a Y cable. For more information about the CoCo's memory map and using add-on hardware devices, see "CoCo Consultations" on Page 94 of the February 1991 issue of THE RAINBOW.)

If you decide to use a Y cable, some precautions are in order. To prevent intermittent disk failures, you should use as short a cable as possible, preferably no longer than a few inches. Also remember that the power supply in the Color Computer is not designed to supply power for much extra hardware. Nor do the CoCo 2 and CoCo 3 supply 12 volts on Pin 2 of the system bus. You'll need to find a way of providing adequate external power on the 5- and 12-volt lines of the Y cable. (The Burke & Burke interface requires 12 volts on Pin 2.)

The *SCS Modification

It is a simple procedure to modify a floppy-disk controller to narrow down part of the *SCS address space that it uses. The aproach we'll take is to intercept the *SCS signal before it enters the controller circuitry, then use a single logic gate (part of a 74LS32) to OR it with the A4 address line. The output of this OR gate is sent to the controller where the unmodified *SCS line was previously attached.

The 74LS32 chip is a quad OR gate; though it contains four gates, you will use only one. The inputs to the three unused gates should be tied High. The easiest way to install the chip is to bend all of its pins to the horizontal, *except pins 7 and 14* (ground and +5 volts), then "piggyback" the chip on top of any other 14-pin 74-series chip already in the disk controller. Make sure the chip is oriented correctly, and solder pins 7 and 14 to pins 7 and 14 of the chip underneath. This provides a solid mechanical mount for the chip and supplies power to it. To tie the unused inputs High, connect pins 4, 5, 9, 10, 12 and 13 of the 74LS32 together and also to Pin 14. Pins 6, 8 and 11 (the unused outputs) may be left unconnected.

Now locate Pin 36 on the disk control-

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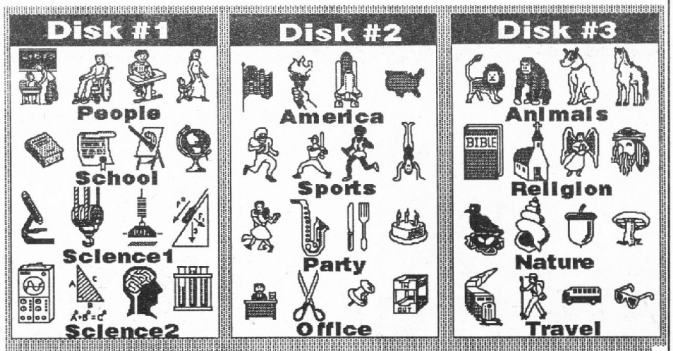

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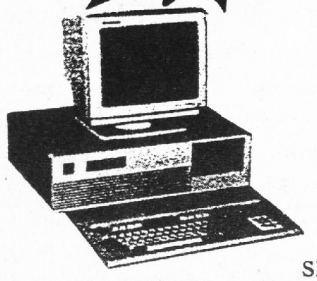

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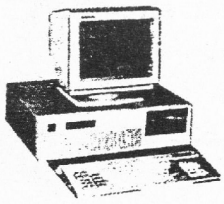

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ler's 40-pin card-edge connector. This is the *SCS pin. Using a Dremel tool or Exacto knife, cut the circuit trace that connects to Pin 36 just beyond the wide portion of the 40-pin connector. Carefully use a soldering iron to attach one end of a jumper wire to the wide part of Pin 36 (the part of the 40-pin connector that is now unconnected). Connect the other end of the jumper to Pin 1 of the 74LS32 chip.

Determine where the trace that previously went to Pin 36 (the *SCS line) goes on the disk controller. Solder a wire to that point. Connect the other end of the wire to Pin 3 of the 74LS32 chip.

Now locate Pin 23 on the 40-pin card-edge connector. This is the A4 address line. Solder a wire to Pin 23 (be careful not to glop solder over the part of the pad that fits in the edge connector) and connect the other end of the wire to Pin 2 of the 74LS32.

Examine the top and bottom of the disk-controller circuit board before cutting any traces. Make sure that where you plan to cut the trace will completely interrupt all traces connected to the *SCS pin. At the same time, make sure all traces that connect to the *SCS pin remain connected together, while separated from the *SCS pin. The *SCS line is used for the Chip Select on the disk-controller chip and as an Enable for the 74LS273 chip that constitutes the register at $FF40. Be sure both of these points are connected to the output (Pin 3) of the 74LS32 after you complete the modification.

If all has gone well, you've modified the *SCS decoding circuitry in the disk controller so that it responds only to addresses in the range $FF40 through $FF4F, and so it no longer ghosts the $FF50 through $FF5F range. To test your work, first set up the system with the disk controller in place. Then at the Disk Extended BASIC prompt, enter `POKE &HFF40,1`. The drive-select light for Drive 0 should come on. Enter `POKE &HFF40,0` to turn the drive-select light off. Now enter `POKE &HFF50,1`. On unmodified controllers, this poke also turns on the drive-select light for Drive 0. But if you performed this modification correctly, `POKE &HFF50,1` will have no effect on Drive 0's drive-select light.

Disto Controllers

The Disto Mini Controller, a short card, needs the modification described here before it will work together with a Burke & Burke interface on a Y cable. However, some of the more-complex Disto controllers present a special problem. They completely decode the *SCS line in the $FF40-$FF4F range for the floppy controller, but they also decode the $FF50-$FF5F range for their internal mini bus (which is used to support serial and parallel ports and a clock). Even when this space is not being used by a Disto plug-in mini-bus card, it is still present on the system and can conflict with other devices. If you own a Disto Super Controller, you must use it with a Multi-Pak or Slot Pak III if you want to preserve the function of the internal mini bus. If you want to use the controller on a Y cable with a Burke & Burke interface, you must perform the modification described above, which renders the mini bus inoperative.

Martin H. Goodman, M.D., a physician trained in anesthesiology, is a longtime electronics tinkerer and outspoken commentator — sort of the Howard Cosell of the CoCo world. On Delphi, Marty is the SIGop of THE RAINBOW's CoCo SIG. His non-computer passions include running, mountaineering and outdoor photography. Marty lives in San Pablo, California.

Feature Program

DOS Boot for BASIC Programs

Most Color Computer users have some familiarity with Disk BASIC's DOS command. This command is used to boot OS-9 and some other commercial software for the CoCo. Wouldn't it be nice to turn on your CoCo, put a disk in the drive and simply enter DOS to boot your favorite BASIC program? *Autoboot* allows you to do this.

Autoboot is a two-program set designed for Disk BASIC 1.1 and 2.1. (Disk BASIC 1.0 and 2.0 do not support the DOS command.) To get started, enter the programs for AUTOBOOT and BOOTDATA as shown in listings 1 and 2, and save them to disk. Because *Autoboot* makes direct changes to the directory track (Track 17), it is important that you be careful to enter the listings exactly as shown. When you first try the *Autoboot* system, use a test disk to make sure it works properly. This is especially important if you have made any alterations to the program.

Before you get started, you must build a machine-language program. To do this, run BOOTDATA, which creates the machine-language program BOOT2.BIN and saves it to disk. After this, you are ready to set up your own DOS-bootable BASIC programs.

Put the disk with AUTOBOOT and BOOT2.BIN in Drive 0 and enter `RUN"AUTOBOOT"`. You'll be asked to insert the disk on which you want to install the auto-boot function. Then the program prompts you separately for the filename and extension of the BASIC program you want DOS to boot. Remember, *Autoboot* works only with BASIC programs; it cannot be used to set up a DOS boot for machine-language programs.

After a few seconds, the program finishes modifying the disk. At this point you can either add the function to another disk or quit. Once you are finished, you can boot the BASIC program on the modified disk simply by entering DOS.

If you try to use *Autoboot* on a disk that is too full, the program will let you know. Just copy the BASIC program to a fresh disk and run *Autoboot* again.

Joel Hegberg enjoys writing games and utilities for the Color Computer and the MM/1. He has been programming for over nine years and is currently developing OS-9/68000 products for Sub-Etha Software. He may be contacted at 936 N. 12th Street, DeKalb, IL 60115-2516.

32K Disk

Listing 1: AUTOBOOT

```
1 'AUTOBOOT
2 'BY JOEL HEGBERG
3 'COPYRIGHT (C) 1992
4 'BY FALSOFT, INC.
5 'RAINBOW MAGAZINE
6 PCLEAR8:CLEAR5000:LOADM"BOOT2.
BIN"
7 CLS:PRINT"INSERT DISK TO HAVE
AUTO-BOOT   FUNCTION INSTALLED O
N AND PRESS ANY KEY.":EXEC44539
8 DSKI$0,17,2,A$,AA$:IFMID$(A$,6
7,2)=CHR$(255)+CHR$(255)THEN11:E
LSEIFMID$(A$,67,2)=CHR$(175)+CHR
$(175)THEN19
9 CLS:PRINT"THIS DISK IS TOO FUL
L AND CAN   NOT HAVE THE AUTO-BO
OT FUNCTION INSTALLED ONTO IT."
10 GOTO20
11 CLS:PRINT"ENTER NAME OF PROGR
AM TO BE     AUTO-BOOTED WITH TH
E DOS COMMANDIS TYPED. (TYPE ONL
Y THE NAME,  NOT THE EXTENSION.)
"
12 LINEINPUT">";NM$:IFLEN(NM$)<1
OR LEN(NM$)>8THENSOUND1,5:GOTO11
13 CLS:PRINT"NOW, ENTER THE 3 CH
ARACTER      EXTENSION OF "NM$".
":LINEINPUT">";EX$:IFLEN(EX$)<>3
THENSOUND1,5:GOTO11
14 IFLEN(NM$)<8THEN NM$=NM$+CHR$
(32):GOTO14
15 N$=NM$+"."+EX$:FORT=1TOLEN(N$
):POKE9735+T,ASC(MID$(N$,T,1)):N
EXTT
16 P=38:POKE234,3:POKE235,PEEK(2
34):POKE236,34:MS=PEEK(&HC004)*
256+PEEK(&HC005)
17 FORT=1TO3:POKE237,T:POKE238,P
:POKE239,0:EXEC MS:P=P+1:NEXTT
18 MID$(A$,67,2)=CHR$(175)+CHR$(
175):DSKO$0,17,2,A$,AA$:GOTO20
19 CLS:PRINT"THIS DISK ALREADY H
AS THE AUTO- BOOT FUNCTION INSTA
LLED. DO YOU WISH TO CHANGE IT?
(Y/N)":LINEINPUT">";K$:IFLEFT$(K
$,1)="Y"THEN11:ELSE20
20 PRINT:PRINT"DO YOU WANT TO DO
 ANOTHER DISK? (Y/N)":LINEINPUT"
>";K$:IFLEFT$(K$,1)="Y"THEN7:ELS
EEND
```

Listing 2: BOOTDATA

```
1 'BOOTDATA
2 'BY JOEL HEGBERG
3 'COPYRIGHT (C) 1992
4 'BY FALSOFT, INC.
5 'RAINBOW MAGAZINE
6 CLS:CLEAR5000:PCLEAR8:TL=0:RES
TORE:P=9728:VERIFYON
7 READA:IFA=-1THEN10
8 POKEP,A:P=P+1:TL=TL+A
9 GOTO7
10 IFTL<>3928THENPRINT"ERROR WIT
H DATA!":ELSEPRINT"EVERYTHING IS
 OK.":SAVEM"BOOT2.BIN",9728,9799
,9730
11 END
12 DATA 79,83,126,38,26,32,32,34
,32,32,32,32
13 DATA 32,32,32,32,46,66,65,83,
34,44,82,0,0,0
14 DATA 134,20,151,25,151,29,151
,31,151,47,151
15 DATA 51,134,22,151,48,127,20,
0,142,38,5,159
16 DATA 166,166,132,126,202,72,0
,-1
```


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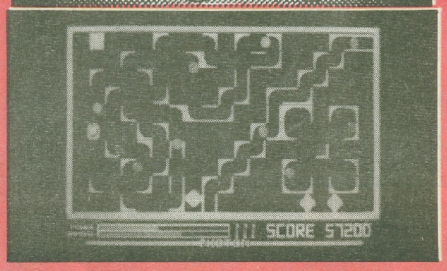

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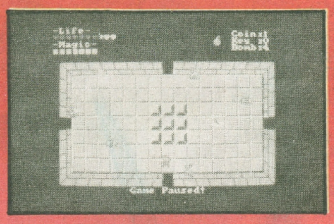

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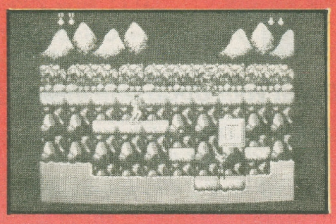

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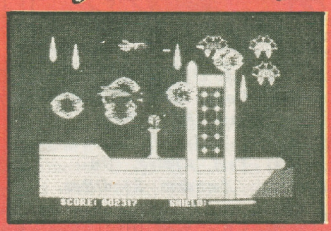

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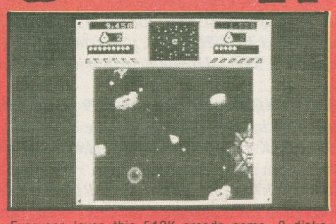

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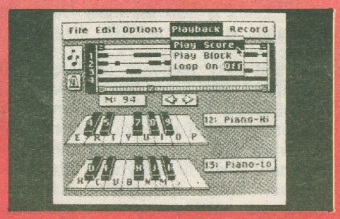

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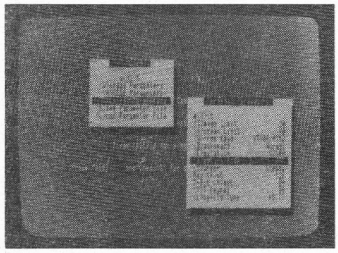
Product Review

KBCom: A Versatile OS-9 Terminal Program

It seems that for many Color Computer users the No. 1 priority is to communicate; over the last 10 years there have been several different telecommunications programs — some good and some bad. I recently had the pleasure of reviewing a good one, *KBCom*, written by Edward W. Kuns and distributed by Kala Software.



To run *KBCom*, you need a CoCo with at least 256K of memory, OS-9 Level II, an RS-232 Pak or equivalent, and a modem (300, 1200 or 2400 bps). *KBCom* comes with its own installation program, making it easy to get started. The program is designed for plug-and-run operation, so you'll be able to get online right away. For *Multi-Vue* users, the package also includes an icon and an AIF.

KBCom is menu-driven and uses pop-up windows to guide you. However, as you gain experience you'll quickly switch to using the built-in "hot keys" to select special features. Another feature advanced users will find helpful is *KBCom*'s support for macros and scripts, which can be used for automation of such functions as downloading of messages and logging on to a host computer. Additionally, user-defined configuration files allow you to tailor *KBCom* for just about any type of system.

File-transfers via X- and Ymodem, as well as Kermit and ASCII, are supported. However, these capabilities are not built into *KBCom* itself; they are provided through external, stand-alone programs that can also be run from within *KBCom*. An advantage to this approach is that you can use the external programs to transfer files without running *KBCom*. I use them along with OS-9's timesharing monitor, `TSMon`, to transport files to and from my PC. Those who don't want to use `TSMon` may be interested in using *KBCom*'s built-in Host mode, which is easy to set up.

In addition to providing support for VT100, VT52, ANSI, OS-9 and CRT emulations, *KBCom* can be run in either a text or a graphics window. If you use a graphics window, special fonts are provided for the terminal emulations noted above. This is very important — I encountered problems using VT100 emulation in a text window when I tried connecting to an SCO XENIX (UNIX) system. Because of the limitations of the OS-9 text-screen character set, certain characters (such as lines and boxes) appeared as alphabetic letters. When I switched to a graphics screen and reconnected, the screen looked just like it should. This has generally been my acid test, and *KBCom* scored high marks.

The only other problem I encountered was in the use of `vi`, a full-screen editor for XENIX. No matter what I tried, I could use only about three-fourths of the screen for the editor. However, the editor did function properly.

Rounding out *KBCom*'s features are a built-in timer and logging functions for keeping track of a session, a conference mode, and the ability to send the output of OS-9 commands through the modem. I find all of these features are necessary in a well-designed communications program. (*Kala Software, 3801 Brown Bark Drive, Greensboro, NC 27410, 919-294-1558; $44.95.*)

— Donald D. Dollberg

Product Review

Sound Ideas: *The Sound Source Library, Volume One*

One of the highlights of the CoCo is its exceptional sound capability. Some programs on the market — many games — feature digitized sound. If you've wanted to include digitized sound in your own CoCo 3 programming endeavors, though haven't had the means to do so, the *Sound Source Library* offers you an alternative.

Volume One of the library includes five digitized samplings: singers wishing you a merry Christmas, gun shots, a bugle call, an electric guitar solo and a scary soundtrack featuring things that go bump in the night — accompanied by haunting vocals.

A short `BASIC` subroutine to load the sound files is provided in the short three-page documentation and on the flip side of the disk. The sound files can be played while a `BASIC` or machine-language program is running. Pokes are given in the documentation to call and control the sound routines. You can stop/start sounds and turn on/off a sound loop function.

The loaded sound files reside in the areas of memory used by the 40- and 80-column text screens. Longer sound files also use `HSCREEN` memory. This being the case, you should avoid using the `WIDTH` and `HSCREEN` commands in conjunction with the sound files. The documentation does state figures for sound-file sizes; however, not mentioned is at what point a file consumes the `HSCREEN` memory locations.

Sound files are stored in four-granule segments. The largest of the supplied samples contains eight segments. The quality of the sounds is fairly good, though as you may have figured, your disk space is held ransom.

If you're a programmer, the *Sound Source Library* may be that extra element to complement your `BASIC` or machine-language creations. Sound-file collectors may also find these samples of interest. (*Color Computing Software, 65 Oak Road, Canton, MA 02021; $6.95 plus $.75 S/H.*)

— Tony Olive

MLBASIC 2.0 - BASIC Compiler

If you want your BASIC programs to run up to 50 times faster, or want more programming features without learning another language, MLBASIC is for you. MLBASIC is the most compatible BASIC compiler available for the Color Computer. WHY? Because MLBASIC fully supports:

- o All available commands offered with normal BASIC, plus more
- o All types of I/O (disk,screen,printer,RS232), plus machine level commands
- o Full floating point arithmetic (same as normal BASIC)
- o All normal BASIC variable types PLUS INTEGER (16 bit) type
- o Use of all available RAM and graphic modes in the COCO 3

MLBASIC not only contains everything that you would expect a BASIC programming language should contain, MLBASIC has features that offer flexibility of other languages like C, Pascal, FORTRAN and even assembly language. These features will allow programmers to directly access the CPU registers on the COCO, produce modular program code with SUBROUTINES, manipulate memory in blocks, and even call ROM routines in other areas of memory.

MLBASIC allows for the first time user to quickly compile a program using default compiler settings. The advanced user has the capability of controlling over a dozen settings which control where the program is compiled, which medium to compile to (memory or disk), string space, compiler listings and more.

"MLBASIC is a fine program for any serious programmer"
said David Gerald in the December 1987 RAINBOW.

With all this going for MLBASIC, you might expect the cost to be a little out of your budget. The normal price is only $59.95, and if you buy MLBASIC now, you will save $10. But don't hesitate, you can have a programming language that will spark your interest in your Color Computer once again.

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Optimize Utility Set 2: Contains two programs to check the integrity of your disks. Detect and correct any directory or file structure errors. Run periodically and before any optimizations to insure the reliability of your data. Look for upcoming review in *Rainbow*. **$19.95; Foreign Postage, add $3.00**

Optimize Utility Set Pac: Combination of both optimize sets. Purchasers of the *Optimize Utility Set 1* can upgrade for $9.95 with proof of purchase. **$39.95; Foreign Postage, add $4.00**

Nine-Times: Each issue contains: 9 helpful and useful programs to help build your OS-9 library • Instructions, examples, and samples of Basic09 procedures and subroutines to help with your own programs and your understanding of Basic09 • C programs and programming examples • Hints, Help columns, and informative articles to advance your knowledge of OS-9 • Supplied totally of 5.25" disk • Bound manual sent to each new subscriber for help in getting *Nine-Times* up and running, as well as tips on using it with a ram disk or hard disk • All graphic/joystick interface for ease of use. **One Year Subscription, $34.95; Canadian Postage, add $1.00; Foreign Postage, add $8.00**

Back Issues: Available for the *May 1989* through *November 1991* issues. Please write for information on Back Issue contents. **$7.00 each; Foreign Postage, add $2.00 each**

Magazine Source: Due to many inquiries, the source code for the magazine graphic presentation shell is being provided as an informational tool. Included is the actual Basic09 source code and compiled modules on disk, as well as documentation and a printed copy of the source code. **$25.95; Foreign Postage, add $5.00**

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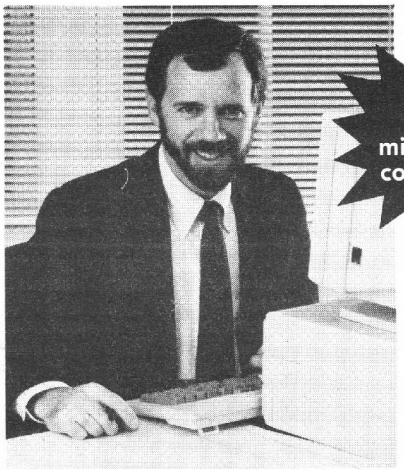

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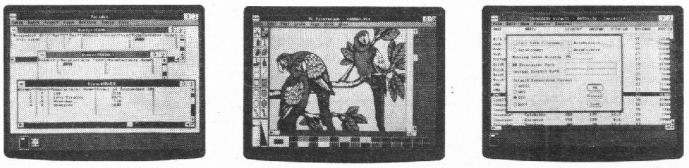

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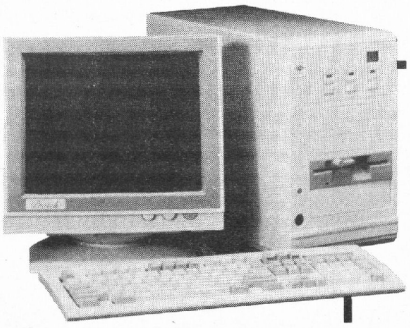

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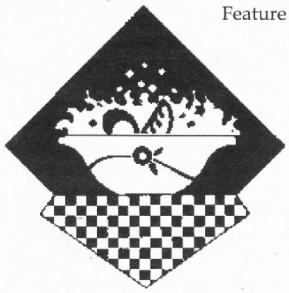
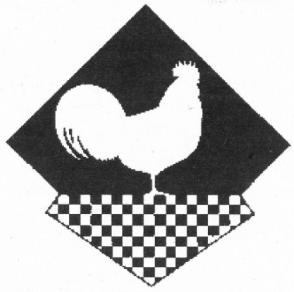


The CoCo 3 Stores Recipes



Do you remember the recipe filer program that appeared in the April 1988 issue of THE RAINBOW (Page 28)? While it did allow me to get rid of all those greasy 3-by-5 index cards, I found the program a little confusing. So I rewrote the original program, made it easier to use, and altered it to take advantage of the CoCo 3's 80-column text screen. With *Recipe Filer II*, you get a better view of the recipe onscreen, and you can edit it much like you edit with a word processor.

In addition to allowing "full-screen" editing, *Recipe Filer II* offers the following options: save, load, kill, clear and print. To invoke one of these commands, just hold the CTRL key and press the first letter of the command you want.

The Save and Load functions are self-explanatory, though it is important to remember that *Recipe Filer II* saves a recipe as a single file. Also, if you used the original and have recipe files stored away, *Recipe Filer II* can read them. The Kill option is used to delete a recipe file from the disk, and the Clear option erases the recipe currently in the editing buffer. The Print command causes *Recipe Filer II* to print a hardcopy of your recipe in 3-by-5 format; the program uses the same printout format as the original program.

To use the program, enter it as shown in the listing, save it to disk and run it. I hope *Recipe Filer II* helps eliminate the confusion and gives you a handy way to store all your recipes.

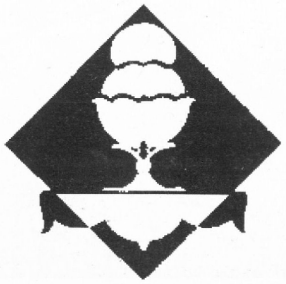
Brad Spencer is a self-taught programmer who enjoys writing programs for the challenge and fun.

CoCo 3

The Listing: RECIPE2

```
1 'RECIPE FILER II
2 'BY BRAD SPENCER
3 'COPYRIGHT (C) 1992
4 'BY FALSOFT, INC.
5 'RAINBOW MAGAZINE
10 POKE &HFFD9,0:POKE &HE414,0:P
OKE &HE42A,0
20 WIDTH 80:PALETTE 0,1:PALETTE
9,63:PALETTE 10,10:PALETTE 11,25
:PALETTE 12,28:PALETTE 13,32
30 POKE &HFF9A,1:ATTR 2,0:CLS:LO
CATE 2,0:PRINT "CTRL:  <S>AVE  <
L>OAD  <K>ILL  <CLEAR>  <P>RINT"
:ATTR 5,0:LOCATE 52,0:PRINT "<CL
EAR> TO DELETE CHARACTER"
```

```
40 ATTR 4,0:LOCATE 29,1:PRINT
"*
** RECIPE FILER II ***":LOCATE 2
5,23:PRINT "USE ARROW KEYS TO MO
VE CURSOR";
50 CLEAR 5000:DIM W$(30)
60 GOSUB 420:GOSUB 440:N=0:C=1:X
=18:Y=5:ATTR 3,0:LOCATE 5,1:PRIN
T "CURSOR LOCATION:";:LOCATE 57,
1:PRINT "LINE NUMBER:";
70 LOCATE 22,1:PRINT C;:LOCATE 7
0,1:PRINT N;:LOCATE X,Y:PRINT ""
;
80 A$=INKEY$:IF A$="" THEN 80
90 IF A$=CHR$(13) THEN 380 ELSE
IF A$=CHR$(12) THEN 300 ELSE IF
A$=CHR$(94) THEN 200 ELSE IF A$=
CHR$(10) THEN 220 ELSE IF A$=CHR
$(8) THEN 240 ELSE IF A$=CHR$(9)
 THEN 270
100 IF PEEK(341)=191 THEN 80 ELS
E IF PEEK(343)=191 THEN 80 ELSE
IF PEEK(344)=191 THEN 80 ELSE IF
 PEEK(342)=191 THEN 500
110 IF N=0 THEN IF X=31 THEN 190
120 IF X=61 THEN 150
130 IF N>0 THEN W$(N)=LEFT$(W$(N
),C-1)+A$+RIGHT$(W$(N),44-C):X=X
+1:LOCATE 18,Y:PRINT W$(N);:C=C+
1:GOTO 70
140 W$(N)=LEFT$(W$(N),C-1)+A$+RI
GHT$(W$(N),14-C):X=X+1:LOCATE 18
,Y:PRINT W$(N);:C=C+1:GOTO 70
150 W$(N)=LEFT$(W$(N),43)+A$:LOC
ATE 18,Y:PRINT W$(N);
160 IF N=15 THEN GOSUB 470:X=18:
Y=6:N=16:C=1:GOTO 70
170 IF N=30 THEN 70
180 X=18:Y=Y+1:N=N+1:C=1:GOTO 70
190 W$(N)=LEFT$(W$(N),13)+A$:LOC
ATE 18,Y:PRINT W$(N);:GOTO 70
200 IF N=1 AND X>31 THEN X=31:Y=
6:C=14 ELSE IF N=1 AND X<32 THEN
 Y=6 ELSE IF N=0 THEN 80 ELSE IF
 N=16 THEN GOSUB 440:Y=23:N=16
210 Y=Y-1:N=N-1:GOTO 70
220 IF N=0 THEN Y=7 ELSE IF N=15
 THEN GOSUB 470:Y=5 ELSE IF N=30
 THEN 80
230 Y=Y+1:N=N+1:GOTO 70
240 IF N=0 AND X=18 THEN 80 ELSE
 IF N=1 AND X=18 THEN X=32:Y=5:C
=15:N=0 ELSE IF N=16 AND X=18 TH
EN GOSUB 440:X=62:Y=22:N=15:C=45
250 IF X=18 THEN X=62:C=45:Y=Y-1
:N=N-1
260 X=X-1:C=C-1:GOTO 70
270 IF N=0 AND X=31 THEN X=17:Y=
8:C=0:N=1 ELSE IF N=15 AND X=61
THEN GOSUB 470:X=17:Y=6:C=0:N=16
 ELSE IF N=30 AND X=61 THEN 80
280 IF X=61 THEN X=17:Y=Y+1:N=N+
1:C=0
290 X=X+1:C=C+1:GOTO 70
300 IF N=0 THEN 350
310 IF X=61 THEN W$(N)=LEFT$(W$(
N),43)+" ":GOTO 330
320 W$(N)=LEFT$(W$(N),C-1)+RIGHT
$(W$(N),44-C)+" "
330 LOCATE 18,Y:PRINT W$(N);
340 GOTO 70
350 IF X=31 THEN W$(N)=LEFT$(W$(
N),13)+" ":GOTO 330
360 W$(N)=LEFT$(W$(N),C-1)+RIGHT
$(W$(N),14-C)+" "
370 GOTO 330
380 IF N=15 THEN GOSUB 470:Y=5
390 IF N=30 THEN 80
400 IF N=0 THEN Y=7
410 X=18:Y=Y+1:N=N+1:C=1:GOTO 70
420 W$(0)=STRING$(14," "):FOR N=
1 TO 30:W$(N)=STRING$(44," "):NE
XT N
430 RETURN
440 ATTR 1,0:LOCATE 14,3:PRINT S
TRING$(20,"-"):LOCATE 14,4:PRINT
 "!";STRING$(19," ");"\":LOCATE
14,5:PRINT "!    ";:ATTR 3,0:PRIN
T W$(0);:ATTR 1,0:PRINT "   \":L
OCATE 14,6:PRINT "!";STRING$(21,
" ");"\"
450 LOCATE 14,7:PRINT "!";STRING
$(22," ");STRING$(28,"-"):P=0:FO
R L=8 TO 22:P=P+1:LOCATE 14,L:PR
INT "!   ";:ATTR 3,0:PRINT W$(P)
;:ATTR 1,0:PRINT "  !";:NEXT L
460 ATTR 3,0:RETURN
470 P=15:ATTR 1,0:LOCATE 14,3:PR
INT:LOCATE 14,4:PRINT STRING$(51
,"-"):LOCATE 14,5:PRINT "!";STRI
NG$(49," ");"!":FOR L=6 TO 20:P=
P+1:LOCATE 14,L:PRINT "!   ";:AT
TR 3,0:PRINT W$(P);:ATTR 1,0:PRI
NT "  !":NEXT L
480 LOCATE 14,21:PRINT "!";STRIN
G$(49," ");"!":LOCATE 14,22:PRIN
T STRING$(51,"-");
490 ATTR 3,0:RETURN
500 IF PEEK(342)<>191 THEN 80 EL
SE A$=INKEY$:IF A$="" THEN 500
510 IF A$="S" OR A$="s" THEN 590
 ELSE IF A$="L" OR A$="l" THEN 6
60 ELSE IF A$="P" OR A$="p" THEN
 820 ELSE IF A$="K" OR A$="k" TH
```



```
EN 910
520 IF A$=CHR$(12) THEN 540
530 GOTO 80
540 ATTR 2,0:LOCATE 19,23:PRINT
"ARE YOU SURE YOU WANT TO CLEAR
THE RECIPE?";
550 A$=INKEY$:IF A$="" THEN 550
560 ATTR 4,0:LOCATE 19,23:PRINT
"      USE ARROW KEYS TO MOVE CU
RSOR      ";
570 IF A$="Y" OR A$="y" THEN 50
580 ATTR 3,0:GOTO 70
590 F$="":I=35:GOSUB 960:ATTR 4,
0:LOCATE 31,11:PRINT "TYPE IN FI
LENAME";:LOCATE 31,12:PRINT "TO
SAVE:";:ATTR 1,0
600 GOSUB 980
610 ATTR 5,0:LOCATE 31,11:PRINT
"                ";:LOCATE 31,12
:PRINT "    SAVING      ";
620 OPEN "O",#1,F$
630 FOR O=0 TO 30:WRITE #1,W$(O)
:NEXT O
640 CLOSE #1
650 GOSUB 440:X=18:Y=5:N=0:C=1:G
OTO 70
660 F$="":I=35:GOSUB 960:ATTR 4,
0:LOCATE 31,11:PRINT "TYPE IN FI
LENAME";:LOCATE 31,12:PRINT "TO
LOAD:";:ATTR 1,0
670 GOSUB 980
680 ATTR 5,0:LOCATE 31,11:PRINT
"                ";:LOCATE 31,1
2:PRINT "    LOADING      ";
690 OPEN "I",#1,F$+".DAT"
700 FOR I=0 TO 30:IF EOF(1)=-1 T
HEN 740 ELSE INPUT #1,W$(I)
710 IF I=0 THEN 760
720 IF LEN(W$(I))<>44 THEN 800
730 NEXT I
740 CLOSE #1
750 GOSUB 440:X=18:Y=5:N=0:C=1:G
OTO 70
760 IF LEN(W$(I))<>14 THEN 780
770 GOTO 730
780 FOR F=LEN(W$(I)) TO 13:W$(I)
=W$(I)+" ":NEXT F
790 GOTO 730
800 FOR F=LEN(W$(I)) TO 43:W$(I)
=W$(I)+" ":NEXT F
810 GOTO 730
820 GOSUB 960:ATTR 4,0:LOCATE 31
,12:PRINT "PRESS <ENTER> TO";:AT
TR 1,0:LOCATE 36,13:PRINT "PRINT
.";
```

```
830 A$=INKEY$:IF A$=CHR$(13) THE
N 840 ELSE 830
840 ATTR 5,0:LOCATE 31,12:PRINT
"   PRINTING...   ";:LOCATE 36,1
3:PRINT "         ";
850 PRINT #-2,STRING$(20,"-"):PR
INT #-2,"!";STRING$(19," ");"\":
PRINT #-2,"!   ";W$(0);"   \":PR
INT #-2,"!";STRING$(21," ");"\":
PRINT #-2,"!";STRING$(22," ");ST
RING$(28,"-"):PRINT #-2,"!";STRI
NG$(49," ");"!"
860 FOR P=1 TO 15:PRINT #-2,"!
 ";W$(P);"  !":NEXT P
870 PRINT #-2,"!";STRING$(49," "
);"!":PRINT #-2,STRING$(51,"-"):
PRINT #-2,"!";STRING$(49," ");"!
"
880 FOR P=16 TO 30:PRINT #-2,"!
 ";W$(P);"  !":NEXT P
890 PRINT #-2,"!";STRING$(49," "
);"!":PRINT #-2,STRING$(51,"-")
900 GOSUB 440:X=18:Y=5:N=0:C=1:G
OTO 70
910 F$="":I=35:GOSUB 960:ATTR 4,
0:LOCATE 31,11:PRINT "TYPE IN FI
LENAME";:LOCATE 31,12:PRINT "TO
KILL:";:ATTR 1,0
920 GOSUB 980
930 ATTR 5,0:LOCATE 31,11:PRINT
"                ";:LOCATE 31,12
:PRINT "    KILLING     ";
940 KILL F$+".DAT"
950 GOSUB 440:X=18:Y=5:N=0:C=1:G
OTO 70
960 ATTR 2,0:LOCATE 28,10:PRINT
STRING$(22,"#");:FOR W=11 TO 14:
LOCATE 28,W:PRINT "#";STRING$(20
," ");"#";:NEXT W:LOCATE 28,15:P
RINT STRING$(22,"#");
970 RETURN
980 LOCATE I,13:PRINT "";:A$=INK
EY$:IF A$="" THEN 980
990 IF A$=CHR$(13) THEN RETURN
1000 IF A$=CHR$(12) THEN 1040
1010 IF LEN(F$)=8 THEN 980
1020 F$=F$+A$:LOCATE I,13:PRINT
A$;
1030 I=I+1:GOTO 980
1040 IF I=35 THEN F$="":GOTO 106
0
1050 F$=LEFT$(F$,I-36):I=I-1
1060 LOCATE I,13:PRINT " ";:GOTO
 980
```

Wizard continued from Page 1

To do so, there must be an open square diagonally behind the piece. Be careful: The Wizard can jump your pieces, too, and it is a challenge to beat him. Unlike checkers, multiple jumps are not allowed. Play continues until the Wizard moves a man into your castle or you eliminate all his men from the board. If the game is a draw, the Wizard is awarded a win.

To get *The Wizard* running, enter the program and save it to tape or disk. Then enter RUN and press any key after the title screen appears. Since the game uses PMODE 3 colors, CoCo 3 owners who use RGB monitors may want to enter RGB before running the game. Also, *The Wizard* uses the high-speed poke in Line 10. You can change this to POKE 65497,0 for the CoCo 3. Remember: Never save a program to tape or disk while the computer is in the high-speed mode. Make sure you enter POKE 65494,0 (POKE 65496,0 for the CoCo 3) first.

Kevin Gattis attends Nash Community College and plans to transfer to North Carolina State and major in computer science. He enjoys playing basketball as well as computer games. Kevin may be contacted at Rt. 1, Box 460, Wilson, NC 27893, (919) 243-4221.

16K Extended

The Listing: WIZARD

```
1 'WIZARD
2 'BY KEVIN GATTIS
3 'COPYRIGHT (C) 1992
4 'BY FALSOFT, INC.
5 'RAINBOW MAGAZINE
10 POKE65495,0
50 GOTO 6000
100 REM SET ARRAY
110 DIM B(8,8),G(8,8),C(4,4),D(4
,4)
120 H1=66:H2=70:V1=138:V2=142
130 PMODE3,1:COLOR4,2:PCLS
200 REM CHECKERS IN MEMORY
210 BC$="C3NR4U4R4D8L4NU4L4U4NR4
U4R4D4"
220 GC$="C1NR4U4R4D8L4NU4L4U4NR4
U4R4D4"
230 DRAW"BM14,14;XBC$;"
240 DRAW"BM30,30;XGC$;"
260 GET(10,10)-(18,18),B
270 GET(26,26)-(34,34),G
290 DRAW"BM110,110;C1D2"
300 DRAW"BM120,120;C1U2"
310 GET(108,108)-(112,112),C
320 GET(118,118)-(122,122),D
340 PCLS
500 REM DRAW ROUTINE
510 COLOR4,2:PCLS
520 FOR X=32 TO 224 STEP 24:LINE
(X,0)-(X,192),PSET:NEXTX
530 FOR X=0 TO 192 STEP 24:LINE(
32,X)-(224,X),PSET:NEXTX
532 FOR X=44 TO 212 STEP 24
533 FOR Y=12 TO 60 STEP 24
534 PUT(X-4,Y-4)-(X+4,Y+4),B
535 NEXTY:NEXTX
536 FOR X=44 TO 212 STEP 24
537 FOR Y=132 TO 180 STEP 24
538 PUT(X-4,Y-4)-(X+4,Y+4),G
539 NEXTY:NEXTX
540 FOR X=68 TO 212 STEP 48:PAIN
T(X,12),4,4:PAINT(X,60),4,4:PAIN
T(X,108),4,4:PAINT(X,156),4,4:NE
XTX
550 FOR X=44 TO 188 STEP 48:PAIN
T(X,36),4,4:PAINT(X,84),4,4:PAIN
T(X,132),4,4:PAINT(X,180),4,4:NE
XTX
552 LINE(0,144)-(32,144),PSET
553 LINE(224,144)-(256,144),PSET
555 PAINT(10,10),1,4
557 PAINT(240,10),1,4
558 PAINT(10,176),3,4:PAINT(240,
176),3,4
560 SCREEN1,0
600 REM COMPUTER FIRST MOVE
610 RAN=RND(7)
620 IF RAN=1 THEN PAINT(44,60),2
,4:PUT(64,80)-(72,88),B
630 IF RAN=2 THEN PAINT(92,60),2
,4:PUT(64,80)-(72,88),B
640 IF RAN=3 THEN PAINT(92,60),2
,4:PUT(112,80)-(120,88),B
650 IF RAN=4 THEN PAINT(140,60),
2,4:PUT(112,80)-(120,88),B
660 IF RAN=5 THEN PAINT(140,60),
2,4:PUT(160,80)-(168,88),B
670 IF RAN=6 THEN PAINT(188,60),
2,4:PUT(160,80)-(168,88),B
680 IF RAN=7 THEN PAINT(188,60),
2,4:PUT(208,80)-(216,88),B
700 REM INPUT ROUTINE
710 GOSUB3000
715 PUT(H1,V1)-(H2,V2),C
720 P$=INKEY$
730 IF P$=""THEN720
740 IF P$=CHR$(8) AND H1>=90 THE
NPUT(H1,V1)-(H2,V2),D:PUT(H1-48,
V1)-(H2-48,V2),C:H1=H1-48:H2=H2-
48:GOTO720
750 IF P$=CHR$(9) AND H1<=162THE
N PUT(H1,V1)-(H2,V2),D:PUT(H1+48
,V1)-(H2+48,V2),C:H1=H1+48:H2=H2
+48:GOTO720
760 IF P$=CHR$(8) AND V1>=42 AND
 H1=66 THEN PUT(H1,V1)-(H2,V2),D
:PUT(H1+120,V1-24)-(H2+120,V2-24
),C:H1=H1+120:V1=V1-24:H2=H2+120
:V2=V2-24:GOTO720
770 IF P$=CHR$(8) AND V1>=42 AND
 H1=42 THEN PUT(H1,V1)-(H2,V2),D
:PUT(H1+168,V1-24)-(H2+168,V2-24
),C:H1=H1+168:V1=V1-24:H2=H2+168
:V2=V2-24:GOTO 720
780 IF P$=CHR$(9) AND V1<=162 AN
DH1=186THEN PUT(H1,V1)-(H2,V2),D
:PUT(H1-120,V1+24)-(H2-120,V2+24
),C:H1=H1-120:V1=V1+24:H2=H2-120
:V2=V2+24:GOTO720
790 IF P$=CHR$(9) AND V1<=162 AN
D H1=210 THEN PUT(H1,V1)-(H2,V2)
,D:PUT(H1-168,V1+24)-(H2-168,V2+
24),C:H1=H1-168:V1=V1+24:H2=H2-1
68:V2=V2+24:GOTO 720
792 IF P$=CHR$(13) AND PPOINT(H1
,V1-2)=1 THEN 800
795 GOTO 720
800 REM GC$ JUMP ROUTINE
810 P$=INKEY$
820 IF P$="" THEN 810
830 IF V1<32 THEN 720
840 IF P$=CHR$(8) AND H1>56 AND
PPOINT(H1-18,V1-26)=2 THEN PUT(H
1-26,V1-34)-(H2-22,V2-30),G:GOTO
920
850 IF P$=CHR$(9) AND H2<200 AND
 PPOINT(H1+24,V1-26)=2 THEN PUT(
H1+22,V1-34)-(H2+26,V2-30),G:GOT
O 920
860 IF V1<48 THEN 720
870 IF H1<50 THEN 900
880 IF P$=CHR$(8) AND PPOINT(H1-
18,V1-26)=3 AND PPOINT(H1-50,V1-
58)=2 THEN PUT(H1-50,V1-58)-(H2-
46,V2-54),G:PAINT(H1-22,V1-26),2
,4:GOTO 920
890 IF P$=CHR$(9) AND H1>176 THE
N 720
900 IF P$=CHR$(9) AND PPOINT(H1+
24,V1-26)=3 AND PPOINT(H1+50,V1-
50)=2 THEN PUT(H1+46,V1-58)-(H2+
50,V2-54),G:PAINT(H1+22,V1-26),2
,4:GOTO 920
905 IF P$=CHR$(8) AND H1<56 THEN
 720
910 GOTO 810
920 PAINT(H1+2,V1-6),2,4:PUT(H1,
V1)-(H2,V2),D:GOSUB3000
1000 REM BLUE JUMP
1010 I=44
1020 J=12
1030 IF I>176 THEN 1060
1040 IF PPOINT(I,J)=3 AND PPOINT
(I+24,J+24)=1 AND PPOINT(I+48,J+
48)=2 THEN PUT(I+44,J+44)-(I+52,
J+52),B:PAINT(I,J),2,4:PAINT(I+2
4,J+24),2,4:GOTO710
1050 IF I<80 THEN 1070
1060 IFPPOINT(I,J)=3 AND PPOINT(
I-24,J+24)=1 AND PPOINT(I-48,J+4
8)=2 THEN PUT(I-52,J+44)-(I-44,J
+52),B:PAINT(I,J),2,4:PAINT(I-24
,J+24),2,4:GOTO 710
1070 IF I=188 THEN I=20:J=J+24
1080 IF I=212 THEN I=-4:J=J+24
1090 I=I+48
1100 IF J=156 THEN 1110
1105 GOTO 1030
1107 REM BC MOVE WITHOUT JUMP
1110 I=44
1120 J=12
1130 IF I=>212 THEN 1160
1140 IF PPOINT(I,J)=3 AND PPOINT
(I+24,J+24)=2 AND PPOINT(I+48,J+
48)=2 AND PPOINT(I,J+48)=2 THEN
PUT(I+20,J+20)-(I+28,J+28),B:PAI
NT(I,J),2,4:GOTO710
1150 IF I=<44 THEN 1170
1160 IF PPOINT(I,J)=3 AND PPOINT
(I-24,J+24)=2 AND PPOINT(I-48,J+
48)=2 AND PPOINT(I,J+48)=2 THEN
PUT(I-20,J+20)-(I-28,J+28),B:PAI
NT(I,J),2,4:GOTO710
1170 IF I=188 THEN I=20:J=J+24
1180 IF I=212 THEN I=-4:J=J+24
1190 I=I+48
1200 IF J=180 THEN 2000
1210 GOTO 1130
2000 REM BC MOVE WITHOUT JUMP2
2010 I=44
2020 J=12
2030 IF I=>212 THEN 2060
2040 IF PPOINT(I,J)=3 AND PPOINT
(I+24,J+24)=2 AND PPOINT(I+48,J+
48)=3 AND PPOINT(I,J+48)=3 THEN
PUT(I+20,J+20)-(I+28,J+28),B:PAI
NT(I,J),2,4:GOTO710
2050 IF I=<44 THEN 2070
2060 IF PPOINT(I,J)=3 AND PPOINT
(I-24,J+24)=2 AND PPOINT(I-48,J+
48)=3 AND PPOINT(I,J+48)=3 THEN
PUT(I-20,J+20)-(I-28,J+28),B:PAI
NT(I,J),2,4:GOTO710
2070 IF I=188 THEN I=20:J=J+24
2080 IF I=212 THEN I=-4:J=J+24
2090 I=I+48
2100 IF J=180 THEN 2200
2110 GOTO 2030
2200 REM BC MOVE WITHOUT JUMP3
2210 I=44
2220 J=12
2230 IF I=>212 THEN 2260
2240 IF PPOINT(I,J)=3 AND PPOINT
(I+24,J+24)=2 AND PPOINT(I+48,J+
48)=3 AND PPOINT(I,J+48)=2 THEN
PUT(I+20,J+20)-(I+28,J+28),B:PAI
NT(I,J),2,4:GOTO710
2250 IF I=<44 THEN 2270
2260 IF PPOINT(I,J)=3 AND PPOINT
(I-24,J+24)=2 AND PPOINT(I-48,J+
48)=3 AND PPOINT(I,J+48)=2 THEN
PUT(I-20,J+20)-(I-28,J+28),B:PAI
NT(I,J),2,4:GOTO710
2270 IF I=188 THEN I=20:J=J+24
2280 IF I=212 THEN I=-4:J=J+24
2290 I=I+48
2300 IF J=180 THEN 2400
2310 GOTO 2230
2400 REM BC MOVE WITHOUT JUMP4
2410 I=44
2420 J=12
2430 IF I=>212 THEN 2460
2440 IF PPOINT(I,J)=3 AND PPOINT
(I+24,J+24)=2 AND PPOINT(I+48,J+
48)=2 AND PPOINT(I,J+48)=3 THEN
PUT(I+20,J+20)-(I+28,J+28),B:PAI
NT(I,J),2,4:GOTO710
2450 IF I=<44 THEN 2470
2460 IF PPOINT(I,J)=3 AND PPOINT
(I-24,J+24)=2 AND PPOINT(I-48,J+
48)=2 AND PPOINT(I,J+48)=3 THEN
PUT(I-20,J+20)-(I-28,J+28),B:PAI
NT(I,J),2,4:GOTO710
2470 IF I=188 THEN I=20:J=J+24
2480 IF I=212 THEN I=-4:J=J+24
2490 I=I+48
2500 IF J=180 THEN 2600
2510 GOTO 2430
2600 REM BC MOVE
2610 I=44
2620 J=12
2630 IF I=>212 THEN 2660
2640 IF PPOINT(I,J)=3 AND PPOINT
(I+24,J+24)=2 THEN PUT(I+20,J+20
)-(I+28,J+28),B:PAINT(I,J),2,4:G
OTO710
2650 IF I=<44 THEN 2670
2660 IF PPOINT(I,J)=3 AND PPOINT
(I-24,J+24)=2 THEN PUT(I-20,J+20
)-(I-28,J+28),B:PAINT(I,J),2,4:G
OTO710
2670 IF I=188 THEN I=20:J=J+24
2680 IF I=212 THEN I=-4:J=J+24
2690 I=I+48
2700 IF J=180 THEN CLS:PRINT"SOR
RY, A TIE GOES TO THE WIZARD."
2710 GOTO 2630
3000 REM CHECK FOR WIN
3010 I=44
3020 J=156
3040 IF PPOINT(I,J)=3 THEN CLS:P
RINT"THE WIZARD HAS OUT SMARTED
YOU  AGAIN!":END
3045 IF J=180 AND I=212 THEN 400
0
3050 IF I=188 THEN I=20:J=J+24
3060 I=I+48
3090 GOTO 3040
4000 REM CHECK FOR WIN
4010 I=44
4020 J=12
4040 IF PPOINT(I,J)=3 THEN GOTO
5000
4045 IF J=180 AND I=212 THEN 500
0
4050 IF I=188 THEN I=20:J=J+24
4060 IF I=212 THEN I=-4:J=J+24
4070 I=I+48
4080 IF J=180 THEN CLS:PRINT"THE
 HUMAN LIFE FORM WINS AGAIN!":EN
D
4090 GOTO 4040
5000 REM CHECK FOR GREEN
5010 I=44
5020 J=12
5040 IF PPOINT(I,J)=1 THENRETURN
5045 IF J=180 AND I=212 THEN CLS
:PRINT"THE WIZARD HAS OUT SMARTE
D YOU  AGAIN!"
5050 IF I=188 THEN I=20:J=J+24
5060 IF I=212 THEN I=-4:J=J+24
5070 I=I+48
5080 GOTO5040
6000 REM TITLE
6010 PMODE4,1:PCLS:SCREEN1,1
6020 W$="U40F8D24E8F8U24E8D40L8H
8G8L8"
6021 I$="U8R8U24L8U8R24D8L8D24R8
D8L24"
6022 Z$="U12E20L20U8R28D12G20R20
D8L28"
6023 A$="U28E12R8F12D28L12U12BU8
NL8U8L8D8BD8NR8D12L12"
6024 R$="U40R16BD8D8L8U8R8BU8R8D
20L8D4F12D4L8H12D12L8"
6025 D$="U40R8BD8D24R8U24L8BU8R8
F8D24G8L16"
6030 DRAW"BM26,60;XW$;"
6040 DRAW"BM64,60;XI$;"
6050 DRAW"BM94,60;XZ$;"
6070 DRAW"BM128,60;XA$;"
6080 DRAW"BM166,60;XR$;"
6090 DRAW"BM198,60;XD$;"
6100 X$=INKEY$
6110 IFX$=""  THEN 6100
6120 SCREEN0,0
6125 CLS:PRINT:PRINT:PRINT:PRINT
6130 PRINT"  ONE MOMENT, PLEASE.
"
7000 GOTO 100
```

Product Review

TV Displays OS-9 Text Files

I find it very frustrating to list a text file and have the statement I am looking for zip by and scroll off the top of the screen. But OS-9's pause mode is pretty cumbersome and CTRL-W requires the reflexes of a Siamese cat in its first incarnation. A far better solution is *TV*, a text-file viewer from MV Systems for OS-9 Level II.

TV allows you to scroll through an OS-9 text file, forward or backward. You can move one line or one page at a time in either direction. Other options allow you to move immediately to the top or bottom of the file and to jump to any specific display line in the file.

TV does not require a specific window size in which to operate. In fact you can use it in any window of any size located anywhere on the screen. *TV* automatically wraps lines in the file to fit the window you're using — unless you tell it not to by entering a command-line option. If you use this option, *TV* truncates the characters at the right edge of the window. I would like to see this modified so you could scroll to the right to view the missing text. Depending on how the program is structured, however, adding such a feature may be infeasible.

It is true there are a couple of similar utilities floating around the shareware and freeware markets. Unlike these, however, *TV* does not automatically quit and return to OS-9 when it reaches the end of the text file. Rather, it waits to see if you want to scroll back through the file. This is a nice touch. Another advantage is MV Systems' claim of immediate support should you have any troubles with its software (I haven't).

TV is compact, inexpensive and easy to use. It is a very handy tool for any OS-9 user's workshop. (*MV Systems, P.O. Box 818, Arvada, CO 80001-0818, (303) 420-7777; $8.95 plus $2.50 S/H.*)

— Cray Augsburg

New Speeds continued from Page 1

Error-Correction Protocols

The MNP and V.42 error-correction protocols achieve error-free transfers by detecting differences between transmitted and received data. (Actually this implies the receiver already knows what it is supposed to receive. If that were true, we wouldn't need to send the data in the first place.) What actually happens is relatively simple.

MNP Level 1 operates much the Xmodem file-transfer protocol. In this method data is assembled into packets, and an error-check value is computed and appended to the data. The packet is then transmitted across the phone lines to the receiving modem. The receiver computes an error-check value as it receives the packet and compares the error-check value it created to the one stored in the received packet. If the two values match, the receiver sends a positive acknowledgment to the transmitter. If the two values do not match, the receiver sends a negative acknowledgment and the transmitter sends the packet again. The disadvantage of MNP Level 1 is that it is a half-duplex protocol — in other words, data is transmitted in one direction at a time in a manner similar to that of CB radio.

MNP Level 2 enhances the efficiency of MNP Level 1 by allowing data to be transmitted in both directions simultaneously. Even with this enhancement, data throughput is reduced to approximately 84 percent compared to that of a non-MNP connection. This effectively means that a 2400-bps connection using MNP Level 2 transmits data at approximately 2016 bps.

MNP Level 3 further enhances the efficiency of data throughput by transmitting the data in synchronous packets — that is, it strips the start and stop bits from the transmitted data. Considering that one start bit and one stop bit are transmitted with every eight bits of data, this effectively increases the efficiency of data throughput by 20 percent and, coupled with other minor enhancements, yields a theoretical throughput of 108 percent compared to a non-MNP connection. Theoretically, then, data throughput of a 2400-bps connection is increased to 2592 bps.

Further, MNP Level 4 reduces the protocol overhead of MNP Level 3 by decreasing the amount of "control" information appearing in each packet and increasing the amount of data transmitted in each packet, thereby yielding a theoretical 5-percent increase in data throughput over that of MNP Level 3.

Of course theories don't always predict real-world events, and these comparisons in data throughput are given to compare the advances made in the various error-correction protocols and should be taken with a grain of salt, so to speak. The single most important reason for purchasing a modem with an error-correction protocol is to obtain error-free connections — not to "boost" data throughput.

V.42, the international standard for error-correction protocols, includes an alternative protocol that is compatible with MNP. Although MNP Levels 3 and 4 operate quite well, V.42 is better suited to detecting and recovering from errors. It uses a 32-bit CRC instead of the 16-bit CRC used by MNP. Indeed, one particular advantage of V.42 is that it is an international standard whereas MNP is a proprietary protocol. We have also discovered that many manufacturers are discontinuing — if they have not already discontinued — MNP modems in favor of V.42.

Data-Compression Protocols

Once an error-free connection is established, the next step is to increase the amount of data transmitted over a given period of time. One such tactic is the use of data-compression protocols in modems such as the MNP Level 5 and V.42*bis*. This is almost identical to the use of an archiving program like *Ar* except that it is performed by the modem and is completely transparent to the computers on either end of the connection. In a typical scenario, the computer sends data to the modem as it normally would. The modem then compresses the data and sends it across the phone lines. The modem on the other end decompresses the data as it is received and sends the decompressed data to the receiving computer.

Using Run-Length Encoding (RLE), MNP Level 5 achieves a theoretical compression ratio of 2:1, while V.42*bis* uses the Lempel-Ziv-Welch (LZW) method of data compression and achieves a theoretical 4:1 compression ratio. ASCII text files typically show the most significant increase in throughput, while files that are already compressed (such as with *Ar*) evidence as little as 60 percent of the throughput found for an ASCII file.

One of MNP Level 5's drawbacks is that it attempts to compress everything it receives — including data that has already been compressed. This can result in the modem's sending more data than is actually contained in the file to be transferred. V.42*bis* automatically disables itself temporarily if it determines that it cannot compress the data being received from the computer.

Dual Speed

The use of data-compression protocols inherently means that a 2400-bps modem transmits data faster than 2400 bps. For example, a 2400-bps modem with MNP Level 5 can transmit data at up to 4800 bps; the same modem with V.42*bis* can transmit data at up to 9600 bps. Assume for a moment that you are using a 2400-bps modem equipped with the V.42*bis* data-compression protocol. Also assume that you are using with that modem a terminal program set at 2400 bps. Even though the modem is receiving the data at 2400 bps — and assuming the data is receiving optimum compression — very little if any speed is gained, because of the delays between each character received by the modem.

Think about this for a moment. Because you are sending data to the modem at 2400 bps, the modem is receiving data at 2400 bps. This means the same amount of data is being transferred between the computer and the modem within the same amount of time. And yes, the modem is sending data across the phone lines at up to four time faster than normal. However, no activity occurs on the phone line between each character received by the modem. This means that up to four times the amount of data is being transmitted in a given amount of time but also that the phone line is inactive for one-quarter of the time — effectively yielding no speed increase.

To achieve optimum performance, data must be sent to the modem as fast as the modem can accept it. For MNP Level 5 this means data should be sent to the modem twice as fast (at 4800 bps) because of its theoretical 2:1 compression ratio. For V.42*bis* it means data should be sent to the modem four times as fast (at 9600 bps) because of its theoretical 4:1 compression ratio.

But what if you are using a 2400-bps modem equipped with V.42*bis* and sending a compressed file to the modem at 9600 bps? Obviously it wouldn't take very much time for the computer to get ahead of the modem, because the computer is sending data to the modem faster than the modem can handle it. This would result in catastrophic data loss. Obviously we aren't smart enough to know how well the modem can compress data, and therefore we don't know how fast to send data to the modem. Even worse, each block may receive more or less compression than the next block, meaning that we'd have to use some type of

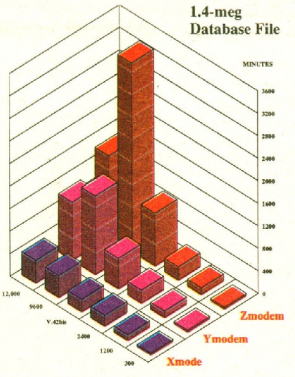


Chart 3: Effect of Data Compression on Throughput

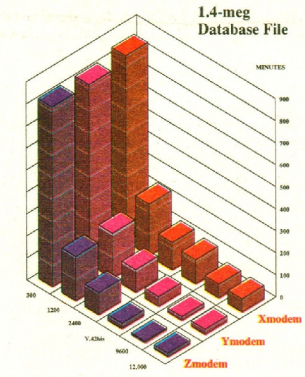


Chart 4: Effect of Data Compression on Download Time

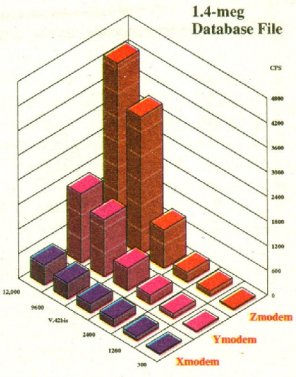


Chart 5: Estimated Throughput of Zoom Turbo

HS	High Speed
AA	Auto Answer
CD	Carrier Detect
OH	On Hook
RD	Receive Data
TD	Transmit (send) Data
TR	Terminal Ready
MR	Modem Ready
FC	Flow Control
EC	Error Correction
DC	Data Compression
V42	V.42/V.42*bis*
V32	V.32
TB	Turbo Mode

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For additional information about the products mentioned in this article, contact the following companies:

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Westlake Village, CA 91362
(800) 706-0333

Baud vs. bps

While you often hear people talk of the speed of a modem measured by its baud rate (300, 1200, 2400 or 9600), technically this is not the correct term. The speed at which a modem performs its task, that of transferring data, is actually measured in *bits per second* (bps).

Baud is the transmission speed of an asynchronous communications channel and technically refers to the maximum number of changes per second that occur in the electrical state of a communications circuit. Computers work with information in bytes — a byte is composed of eight bits — and these bits are what actually are transferred by the modem. So the true measure of a modem's transfer speed is the number of bits it can send per second. Don't misunderstand, modems still have a baud rate; it's just that this is not the correct term for measuring its transfer speed.

The confusion between, and the misuse of, the two terms originates from the early days of PC telecommunications, when a 300-baud modem transferred data at 300 bits per second. As modems evolved, the number of bits per second transferred actually surpassed the baud rating. For example, what is referred to as a 1200-baud modem actually operates at 600 baud and transfers data at 1200 bits per second. By contrast, a 9600-bps modem following the V.32 protocol operates at 2400 baud.

The term *baud* is actually the contraction of the surname of Frenchman J.M.E. Baudot, who derived a five-bit code adopted by the French telegraph system in 1877.

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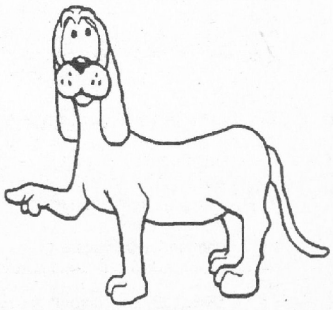

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M7	GR7	H2	U7	GA7
	GR8	H3	U8	GA8
A1	GR9	H4		GA9
A2	GR10			GA10
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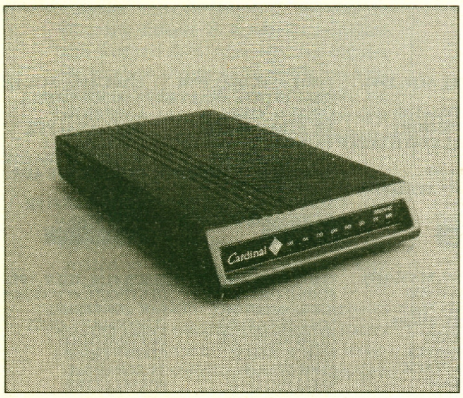


Cardinal 9600 V.42*bis* Modem

Flow Control

Fortunately, an error-correcting modem implements a feature known as *flow control* that tells us when it is ready to receive more data and when to stop sending data. Software flow control operates in a manner similar to that of a traffic light. When the modem cannot handle further data, it sends an XOFF (13 Hex) character to the computer. This is akin to the traffic light turning red. However, the computer may not see the "red light" light immediately. It continues to send data until it notices the traffic light, and this may result in the computer sending more data than the modem can handle on occasion (resulting in a situation somewhat like that of someone running a red light and causing an accident). Another drawback of software (or XON/XOFF) flow control is that it may preclude the transfer of binary files — the mere appearance of an XOFF character in a binary file being received may cause the computer to assume the modem wants it to quit sending data. (When the modem is ready to receive data, it sends an XON — 11 Hex — character to the computer.)

Hardware flow control operates in a manner similar to an electronic device in your car that would automatically apply the brakes as you approached a traffic light. It uses two signals known in computer terminology as RTS (Request To Send) and CTS (Clear To Send). When the modem cannot handle further data, it changes the CTS signal to an inactive state. Once the modem is prepared for more data, it changes the CTS signal to an active state. If you have a choice, hardware flow control is preferable to software flow control because of its transparency.

High-Speed Modems

Once you move beyond 2400-bps modems, you step into a new dimension of modem technology. Although many standards exist for high-speed modems, the most popular are the US Robotics HST, V.32 and V.32*bis*. The US Robotics HST proprietary standard transmits data at up to 14,400 bps, in which data is transmitted at 14,400 bps in one direction and 450 bps in the other direction. The direction of transmittal at 14,400 bps is changed "on the fly" depending upon which modem has the most data to transmit. The V.32 international standard transmits data at a base speed of 9600 bps, incorporates the V.42 error-correction protocol and the V.42*bis* data-compression protocol, and includes a fall-back speed of 4800 bps. The V.32*bis* international standard transmits data at a base speed of 14,400 bps, incorporates V.42 and V.42*bis*, and includes fall-back speeds of 7200 and 12,000 bps. V.32*bis* is also completely compatible with V.32, meaning that a modem incorporating V.32*bis* will fall back to 9600 bps if it is connected to a modem incorporating V.32.

At the present time very few BBSs support V.32*bis*, although support is slowly increasing as manufacturers begin to sell V.32*bis* modems. Indeed most BBSs and online services still operate at 2400 bps, though the trend is shifting toward 9600 and 14,400 bps.

Testing

We tested each of the modems by calling Delphi via SprintNet and Tymnet and by calling various local BBSs. The 9600-bps modems were also tested with calls to Delphi via one of SprintNet's 9600-bps nodes and to CompuServe via its toll-free 9600-bps number.

Phone-Line Surge Protection

While they are very rare, voltage surges or spikes can enter your home or office through a phone line and irreparably damage your modem and computer as well as other telecommunications devices such as a fax machine or a telephone. In addition to a surge protector for your computer, you should also invest in a surge protector for your modem. You can buy such a device at your local Radio Shack store or other computer-supplies vendor. Called the Spike Protector (Cat. No. 43-102), it sells for $12.95 and consists of a three-prong plug unit with RJ-11 modular jacks and a short telephone cord with modular connectors.

For speed-testing the modems, we used rather large files to gain a better impression of performance. For this reason the tests were performed in-house on our internal phone system, using a Tandy 3000 running the *Telegard BBS* and the XOO FOSSIL driver and a Tandy 1000 TL/2 running *Procomm Plus* and *Crosstalk Mk. 4*. Various combinations of modems were used on both the 1000 and the 3000. We transferred two test files using the Xmodem, Ymodem and Zmodem file-transfer protocols with each modem. These test files included a 722K compressed (*PKZIP*) file and a 1.4-Meg database file.

Glossary of Telecommunications Terms

Bell 103 the North American standard for data communications at 300 bps.

Bell 212A the North American standard for data communications at 1200 bps.

bis a French word loosely translated as *the same but slightly different*.

bit an abbreviation for binary digit; refers to the smallest unit of information used in a computer. It has a value of either 0 or 1.

bps an acronym for bits per second.

byte a group of eight bits that are considered a single unit.

carrier signal a signal on the telephone line that carries the bits to and from your modem.

compression a method of compacting data by way of a mathematical algorithm that removes or eliminates gaps, redundancies and unnecessary data so the data takes up less storage space. In telecommunications this means faster data transfer.

CCITT the International Telephone and Telegragh Consultative Committee (CCITT is the abbreviation of its French name); an organization that sets telecommunications standards. The CCITT is part of the International Telecommunications Union, which in turn is a part of the United Nations.

cps an acronym for characters per second; refers to the number of characters per second passing a point in a communications channel.

DCE an acronym for data-communications equipment; generally refers to a modem or printer.

DCE-DCE Speed the speed at which data is transferred from one modem to another.

DTE an acronym for data-terminal equipment; generally refers to a computer or terminal.

DTE-DCE Speed the speed at which data is transferred from the computer to the modem.

full duplex a communications setting that allows the sending and receiving of information at the same time.

half duplex a communications setting that allows the sending and receiving of information in only one direction at a time.

handshaking the initial exchange of signals between two modems prior to connection.

MNP an acronym for Microcom Networking Protocol; a proprietary error-detection and -correction protocol. There are several levels of MNP error correction, known as service classes, referring to the specific techniques used by a modem to transfer data.

parity a form of error checking that increases the chances of each character's correct reception by the other system. Parity is set within the telecommunication software; Even, Odd and None are the most common settings.

protocol a form of agreement between two modems that assures file-transfer reliability. Both modems respond to the same control codes or commands in the same way by following a certain specified procedure when transferring a file. Protocols range from the simple XON/XOFF flow control to the common Xmodem, Ymodem and Zmodem to the highly sophisticated MNP and V.42*bis*.

start/stop bits The start bit is transmitted at the beginning of each byte to notify the receiving modem that the next eight bits contain the data. The stop bit is transmitted at the end of the byte to notify the receiving modem that sending has finished and to prepare for the next byte.

throughput the total amount of data passed along a communications channel in a specific time.

V.22 an international standard for data communications at 1200 bps. This standard, used throughout Europe, is rarely used in North America.

V.22*bis* an international standard for data communications at 2400 bps. This standard is used throughout North America and Europe.

V.32 an international standard for data communications at 9600 bps, with an alternate speed of 4800 bps.

V.32*bis* an international standard for data communications at 14,400 bps with alternate speeds of 7200 and 12,000 bps.

V.42 an error-correcting protocol featuring an alternate protocol compatible with MNP; an accepted international standard.

V.42*bis* a data-compression protocol providing a data-compression ratio of approximately 4:1; an accepted international (CCITT) standard for error correction.

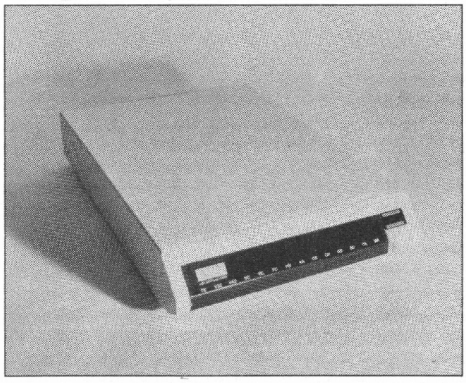
Xmodem an error-checking file-transfer protocol that transfers data in blocks of 128 bytes. Data is sent one block at a time with an idle period after the transfer of each block while the sender waits for an acknowledgment that the receiver has received the data correctly. If an error is detected, the block is resent. Xmodem was created in 1977 by Ward Christensen.

Ymodem an error-checking file-transfer protocol that transfers data in blocks of 1024 bytes. Data is sent one block at a time with an idle period after the transfer of each block while the sender waits for an acknowledgment that the receiver has received the data correctly. If an error is detected, the block is resent. Ymodem was adapted from Xmodem by Chuck Forsberg in 1981.

Zmodem an error-checking file-transfer protocol that transfers data in a block length potentially as long as the entire file being transferred. This technique, known as streaming, sends data in subpackets of 1024 bytes nonstop, with the receiver remaining silent unless an error is detected. If an error is detected, its position in the file is located to within 1024 bytes; transmission is resumed at that point. In addition to its superior transfer and error-correction techniques, Zmodem also incorporates *crash recovery*, meaning that if for some reason you lose your connection while downloading a file, you can call back and resume the download at the point of disconnection; you don't have to start the download all over. Zmodem's creation by Chuck Forsberg in 1986 was funded by Telenet.

Using the 722K compressed file shows the effects of transferring a file with the V.42*bis* data-compression protocol disabled. The 1.4-Meg database file was used to show the effects of "optimum" data compression. All data represented in the charts is shown in Figure 1 for your reference. We included this information so you can cross-reference the chart data with the actual numbers. However, the download time shown for the 300- and 1200-bps file transfers are estimates, due to the enormous amount of time required to actually transfer the files. Here we noted the amount of data transferred after one hour and then estimated the total download time based on these figures.

Chart 1 shows the average data throughput of the 722K compressed file and represents the base data throughput without the use of data-compression protocols in the modem — although data compression was enabled throughout the tests. Chart 2 shows the total download time for the same file.



Zoom V.32 9600 Modem

An interesting phenomenon occurs when transferring this file with the Xmodem file-transfer protocol. As noted, the average data throughput is 191 cps with a 2400-bps modem but is reduced to 150 cps with a 2400-bps modem using V.42*bis*. Initially we thought the settings of the modems were incorrect, but the same result occurred several times after we verified all settings. It appears that Xmodem's small block size and the fact that it is a half-duplex protocol is effectively incompatible with the V.42 error-correction protocol — although this is speculation on our part. If nothing else, the data in Chart 1 shows the relative inefficiency of the Xmodem file-transfer protocol, especially at the higher speeds.

Chart 3 shows the average data throughput for the 1.4-Meg database file using V.42*bis* data compression. Chart 4 shows the same data as it relates to the total download time. The data shown in these two charts really expose the inefficiency of Xmodem, especially when it is compared to Zmodem.

However, it should be mentioned that the Zoom modem was tested while connected to a US Robotics HST modem at 12,000 bps with no data compression, while the V.32 modem used V.42 error correction and V.42*bis* data compression. This makes the Zoom modem appear to be much slower than it actually is. Unfortunately we were unable to locate a compatible modem with V.32*bis* to obtain true timing comparisons. The data in Chart 1 is accurate for the transfer of the compressed file and should give you a good comparison of the base speed of the modems.

If we overlay the results obtained using V.32 onto the results obtained from the Zoom Turbo modem, we estimate data throughput of the database file at 483 cps for Xmodem, 1676 cps for Ymodem, and 4318 cps for Zmodem. This estimation of the throughput for the Zoom Turbo modem is shown in Figure 5. However, please remember that these three figures are estimated based on the amount of data compression found for a V.32 modem.

It is interesting to note that the total transfer time for the 1.4-Meg database file is shorter than the time required to transfer the 722K compressed file with the V.42*bis* data compression and the Zmodem file-transfer protocol. Remember, though, that the 1.4-Meg database file was originally not compressed. When you consider that the 722K compressed file contains 1,606,559 bytes of data, you realize that the two are actually transferring about the same amount of data. Therefore, the compressed file is still transmitted faster than the non-compressed database file.

		Compressed File		Database File	
		CPS	Time	CPS	Time
300	Xmodem	28	7:20:04	28	14:05:24
	Ymodem	29	7:04:54	29	13:36:15
	Zmodem	29	7:04:54	29	13:36:15
1200	Xmodem	101	2:02:00	101	3:54:22
	Ymodem	116	1:46:13	116	3:24:03
	Zmodem	118	1:44:25	118	3:20:36
2400	Xmodem	191	1:04:30	191	2:03:56
	Ymodem	230	0:53:34	230	1:42:55
	Zmodem	237	0:51:59	237	1:39:52
V.42bis	Xmodem	150	1:22:08	218	1:48:35
	Ymodem	250	0:49:17	541	0:43:45
	Zmodem	266	0:46:19	931	0:25:25
9600	Xmodem	318	0:38:44	385	1:01:29
	Ymodem	835	0:14:45	1391	0:17:01
	Zmodem	1072	0:11:29	3347	0:07:04
12,000	Xmodem	399	0:30:54	403	0:58:38
	Ymodem	1006	0:12:15	1025	0:23:02
	Zmodem	1383	0:08:55	1440	0:16:12

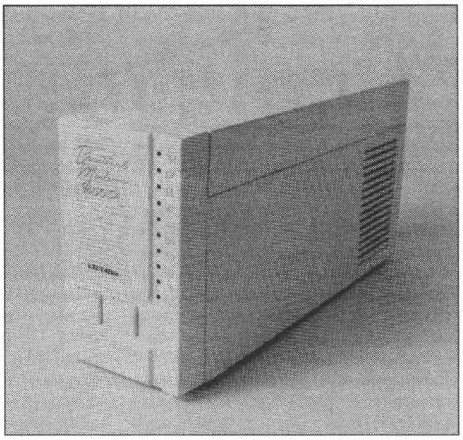
Figure 1: Reference Data for Charts 1-5

Looking at Real Modems

Cardinal 9600 V.42*bis* Modem

The Cardinal 9600-bps modem (available from Micro Systems, $359) comes in an attractive black-metal case in a style similar to that of Hayes modems. The auto-answer LED on the front panel flashes to indicate an incoming call. The back panel accomodates a power switch, a 5-pin DIN connector for the external wall transformer, a DB-25 connector for the serial cable, and two RJ-11 phone jacks.

Although its name seems to imply a 2400-bps modem with V.42*bis* data compression to achieve 9600-bps throughput, the Cardinal 9600 is a true 9600-bps modem with the V.32 protocol. Of course it also supports V.42 error correction and V.42*bis* data compression, as well as the MNP alternate protocols. It is also completely backward-compatible with 300-, 1200- and 2400-bps modems and uses the Hayes AT command set with input in either upper- or lowercase.



Practical Modem 9600SA

As with most other modems these days, the speaker volume is controlled with the `ATLn` command instead of an external volume control. Up to two user-definable configuration profiles can be stored in non-volatile RAM along with four phone numbers.

Practical Modem 9600SA

The Practical Modem 9600SA V.32 modem from Practical Peripherals ($699) comes in a 10-by-3-by-5-inch modem case that stands vertically in a "mini-mini tower" configuration rather than the horizontal

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orientation of most other modems. Ten LED status indicators run vertically along the right side of the front panel, and located at the bottom are two momentary-contact switches for power and immediate-answer, which allows you to answer incoming modem calls on the fly. (Of course you can also set the answer mode via AT commands.) The standard phone and line RJ-11 jacks, as well as the jack for the external power supply and the RS-232 port, are located on the rear panel. Practical Peripherals includes a lifetime warranty for the modem and operates a technical-support BBS.

Powering on the PM9600SA activates the Power On Self Test (POST). Besides the default factory-configuration information stored in ROM, you can view onscreen a six-page help summary of the modem's commands by issuing the `AT$H` command. NVRAM can store two user-defined configuration profiles and four 36-digit telephone numbers displayable with the `AT&V` command. Data buffering in RAM provides DTE (Data TErminal) rates of up to 38,400 bps and supports both hardware and software flow control for both DTE and modem-to-modem.

This V.32 modem incorporates both V.42 error correction and V.42*bis* data compression. It also supports automatic feature negotiation that allows it to connect to CCITT V.32-compliant 9600-bps, standard 2400-bps, V.22*bis* or MNP modems.

Zoom 2400-bps Modem

The Zoom 2400-bps modem (available from Granite Computer Systems, $85) features MOV (Metal-Oxide Varistor) lightning protection; phone-line impedance matching (for minimizing line echo); an amplified speaker; and full compatibility with Hayes S-Registers, dial commands and AT commands. The unit comes in a smoke-black plastic case and is relatively unobtrusive compared to other external modems. Physical dimensions are 5 by 6 by 1½ inches.

Included with the package are a single phone cable and an AC adapter. On the rear panel are two RJ-11 jacks (for an extension telephone and a wall cable), a power jack and switch, and a DB-25 serial connector. Also included are a jam-packed instruction manual and introduction packages for several online services including CompuServe, Delphi and GEnie.

Zoom 2400 V.42*bis*

The Zoom 2400 V.42*bis* modem (available from Granite Computer Systems, $149) comes in a large white-metal case that measures 7.75 inches wide, 11.375 inches long, and 1.75 inches tall. Indeed its only drawback is its odd size, which may require a bit of imagination on your part to determine where on the desk to put it.

On the back panel are connectors for the external wall transformer, a DB-25 connector for the serial cable, and two RJ-11 phone jacks. One nice feature of the Zoom modem is that the power switch is located on the front panel within easy reach. We found this to be a much better arrangement than that of modems with power switches on the back panel. The features of the modem are comparable to those of the Practical Modem 2400 V.42*bis*.

Zoom V.32

The Zoom V.32 9600-bps external modem (available from Granite Computer Systems, $399) comes housed in an attractive white case measuring 11½-by-7¾-by-2 inches. The power switch is conveniently positioned in the lower-right corner of the front panel. The rear panel of the modem contains two RJ-11 jacks for the phone line and an optional telephone, and a connector for the power adapter.

Maximum efficiency is achieved through an onboard 16-MHz controller and a V.32 Data Pump. NVRAM is used for storing configuration information, including four 36-digit number strings.

This Zoom modem uses the CCITT V.32 international standard for 9600-bps data transmission and also supports 300/1200/2400/4800 bps. A Turbo mode increases data throughput by kicking data transmission speed up to 12,000 bps in full-duplex mode when connected to another modem that supports Turbo mode; this includes most V.32*bis* modems. Communication with V.32*bis* modems is possible because Turbo mode is a standard modulation technique that conforms to the official CCITT V.32*bis* recommendation.

The Zoom V.32 supports V.42, MNP 2-4, V.42*bis* and MNP 5 protocols. All protocols, including the Turbo mode, are automatically negotiated to attain the fastest speed and highest level of compression and error correction supported by both modems in any telecommunication situation.

Other features found on the Zoom V.32 modem include both asynchronous- and synchronous-operation modes, the ability to force MNP 2-4, V.42, MNP 5 or V.42*bis*, automatic self-diagnostics, and support of both the AT and extended AT command sets.

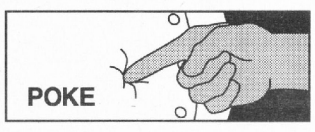
Building a Serial Cable

Connecting a modem to the 4-pin DIN connector on the rear of the Color Computer can be quite a challenge if you don't have a properly configured cable laying around. If you don't want to build your own modem cable from scratch, pre-made 4-pin DIN to DB-25 cables can be purchased from CoCoPRO! and modem cables for the RS-232 Pak are readily available from any number of sources, including Radio Shack. If you prefer to make your own cable, you'll need a male 4-pin DIN connector (Catalog No. 274-007), male DB-25 solder-cup connector (Catalog No. 276-1547) and hood (Catalog No. 276-1510), and a four to six foot length of 4-conductor cable (Catalog No. 278-777). You'll also need a soldering iron, 60/40 rosin-core solder, wire cutters and strippers, screwdrivers, a small vice and two one-inch lengths of stranded wire (for jumpers).

Strip approximately one inch of insulation from each end of the 4-conductor cable, then strip approximately ¼-inch of insulation from each wire on both ends of the cable. Place the 4-pin DIN connector in the vice and solder one of the wires to each post in the connector. For color-coding purposes, you might solder the yellow wire to Pin 1 (Carrier Detect), the red wire to Pin 2 (Receive Data), the black wire to Pin 3 (Ground) and the green wire to Pin 4 (Transmit Data). Once all wires are soldered, remove the DIN connector from the vice and put the DB-25 connector in the vice. Turn the cable over so that the end with the DIN connector is facing the floor and slide the hood for the DIN connector down the cable — make sure the hood is facing in the correct direction. Don't snap the hood in place just yet.

Hold both one-inch jumpers in one hand in parallel and twist one end together so that it forms a "Y" jumper. Tack solder the connection using just enough solder to hold the wires together. Assuming you used the same colored wires mentioned previously, twist one end of the Y jumper with the yellow wire and tack solder it in place. Insert one end of the Y jumper into Pin 6 and solder it in place. Solder another end of the Y jumper to Pin 8, and the remaining end to Pin 20. Solder the green wire to Pin 2, the red wire to Pin 3 and the black wire to Pin 7.

After all connections have been soldered, use an ohmmeter to measure the resistance from each pin of the DIN connector to each pin of the DB-25 connector. If everything checks out, install the hoods on the connectors and connect the cable to the serial port and modem. At this point you should have a working serial cable.



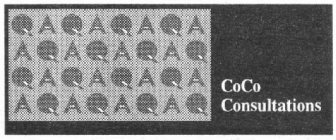
At times it is necessary to erase the CoCo's memory, resetting the system to its power-up state. To do this without having to reach behind the machine to turn it off, simply enter

```
POKE 113,0:EXEC &HA027
```

for the CoCo 1 and 2, or

```
POKE 113,0:EXEC &H8C1B
```

for the CoCo 3.



Jamming on the Keyboard

When I press the D or E key on my CoCo 3 keyboard, both letters appear on my screen. That is, if I press D, I get DE on the screen, and if I press E, I also get DE on the screen. The same problem occurs with T and U, and also with M and L. What do you think might be the problem? How would you suggest I go about diagnosing and fixing it?

Bob Mueller (K6ASK)
Azusa, California

A Keys D and E, M and L, and T and U are all in the same columns in the keyboard matrix. The column with D, L, and T goes to Pin 14 of the keyboard PIA. The column with E, M and U goes to Pin 15 of the keyboard PIA. I suspect that with the problem you report, you also are having problems with duplication of the following key pairs: down arrow and left arrow, 4 and 5, comma and dash, and CTRL and F1. Apparently Pins 14 and 15 of the keyboard PIA are shorted, either inside the PIA, on the CoCo circuit board, inside the ribbon-cable socket for the mylar keyboard cable, or inside the keyboard.

Playing the odds, I suspect the problem is inside the keyboard PIA and that you will have to replace the 40-pin keyboard PIA. Of course try plugging in another keyboard to see if the problem persists, and to eliminate the possibility that the problem is in the keyboard — although I personally doubt this.

The keyboard PIA is soldered to the board and is best destructively removed: Use cutting pliers to cut all 40 pins of the PIA individually, then use a soldering iron and needle-nose pliers to gently heat and remove all of the pins from the pads for the chip. Then use a solder sucker to clean all 40 holes. Examine both sides of the board carefully for any damaged traces or shorts and, when you are sure all is well, solder in a good quality machine-pin or double-wipe socket (never use a single-wipe socket) where the PIA used to be. Tandy is the only source of official keyboard PIAs for the CoCo 3, but I have been told by Jim Harrison that a 68B21 will work as a keyboard PIA, and the 68B21 is readily available at most electronics outlets.

RS-232 Ports

What is the difference between the Disto RS-232 port on the little board inside Disto disk controllers, the RS-232 port provided by the Tandy RS-232 Pak and the CoCoPRO! RS-232 pack?

Lute Mullenix (LUTE)
Hazel, South Dakota

A The Disto RS-232 port, Tandy RS-232 Pak, and CoCoPRO! RS-232 pack all use the same 6551 ACIA to convert parallel data on the CoCo system bus to serial data at 150 to 19,200 bps. However, the Disto mini-bus RS-232 port is addressed at $FF50 through $FF5F, whereas both the Tandy RS-232 Pak and the CoCoPRO! RS-232 pak address the 6651 ACIA at $FF68 through $FF6B. Thus, the same OS-9 device driver can be used with any of these ports, but the device descriptor for the Disto port reflects the different address at which its 6551 ACIA is mapped.

A minor difference between the CoCoPRO! RS-232 pack and the Tandy RS-232 Pak is that the CoCoPRO! unit does not support the CTS, RTS, and DSR lines of the RS-232 port. A major difference is that the CoCoPRO! RS-232 pack is currently in production and available for sale, whereas Tandy's RS-232 Pak is no longer available commercially — although used Tandy RS-232 Paks may be available in the Classified Ads section of the CoCo SIG on Delphi.

NEC MultiSync II

How can I connect my NEC MultiSync II monitor to my CoCo 3?

Ken Dorsey
Fort Worth, Texas

A The NEC Multisync II monitor can be used with the CoCo 3. Make a cable that connects red, green, blue, horizontal sync, vertical sync, and ground lines from the CoCo 3's RGB video connector to those pins on the NEC MultiSync II. Then set the MultiSync II for Analog RGB input. If the monitor has a setting for horizontal- or vertical-sync polarity, be sure to set it for positive sync. You should get an excellent, sharp image on the NEC MultiSync II.

FD-502 Controller Blues

I have an FD-502 disk controller that fails to format disks. I can successfully read and write files with it but cannot format a disk with it. If I substitute another controller, I can format disks prop-

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erly using my cable and drives, and when I use the suspect controller with another cable and drives, I again cannot format disks. I believe the problem is in the controller; any suggestions on how to fix it?

Brian Schubring (THESCHU)
Bloomingdale, Illinois

A You have done excellent diagnostic tests, and I agree with your conclusion. The index pulse from the disk drive is used for the Read Track and Write Track functions. Now, the Read Track function is not used by Disk BASIC, but the Write Track function is used to format a track. The index pulses are not used at all during normal read and write operations, which are the operations used to read and write files on an already formatted disk. What all this means is that a failure to format where reading and writing files is OK is almost certainly the result of a problem with the index pulse. The index pulses arrive at the disk controller on Pin 8 of the 34-pin cable. There is a 150-ohm pullup resistor attached to this line, which is then sent directly to Pin 24 of the 1773 floppy-disk controller chip. That is all there is to the index circutry on the FD-502 card. Check the circuit very carefully. Look for lack of continuity between Pin 8 on the disk-controller cable and Pin 24 of the 1773 FDC chip. Look for a possible short to ground. If neither is present, the problem is with the 1773 chip, which must be replaced.

(Brian replied on Delphi the day after I suggested this approach: I checked the FD-502 controller as you suggested and found a short between Pin 8 of the 34-pin ribbon-cable connector and ground, due probably to poor quality control. The short was on the solder side of the board in the vicinity of one of those little choke coils. I removed the short to ground, and my FD-502 controller is now working fine.)

96-TPI Disks

Q *I saw some 5¼-inch disks for sale that were described as 96-TPI, 80-track. Can I use these with my 40-track double-sided drives?*

Alain Pilon (ALAIN)
Brossard, Quebec
Canada

A There is a great deal of confusion in the naming of 5¼-inch disks. All 5¼-inch 80-track disks have 96 tracks per inch (TPI), and all 5¼-inch 40-track disks have 48 tracks per inch. However, the total number of tracks that can be formatted is not the whole story. There are two types of 5¼-inch 80-track (96-TPI) disk drives. Long ago some 80-track drives were made that were fundamentally similar to 40-track drives except the tracks were half the width. These 80-track drives could hold a total of 720K of formatted data and were used in CP/M systems, and for a while were popular with OS-9 users. Disks specifically made for these drives were called 80-track, 96-TPI disks and were, at one time, called Quad Density — an extremely stupid and confusing name, in my opinion. Such disks would work fine with 40-track drives, too. Today's 5¼-inch 40-track disks should, by and large, work fine in those old 5¼-inch 80-track drives. Some years back IBM introduced a wholly different kind of 5¼-inch 80-track, 96-TPI drive. It has been variously called the AT-style, High-Density, or 1.2-Meg drive. These drives use a higher-speed disk controller and cannot be used with ordinary Color Computer disk controllers. Further, these drives use disks that have very different media. The media for the 1.2-Meg disks have more than twice the magnetic coercivity than that for the 360K and 720K drives. Thus, a high-density, 1.2-Meg, AT-style disk cannot be used in a 40-track drive. The problem is that both the high-density, AT-style, 1.2-Meg disks (which cannot be used in a CoCo drive) and the 720K-style 5¼-inch disks (which can be used) have 80 tracks. Saying the disk is 80-track or 96-TPI does not distinguish between these two totally different types of disks. By common convention, I suspect the disks you are looking at are not AT-style, 1.2-Meg disks, for those are usually termed High-Density, 1.2-Meg or AT-style.

Multi-Paks and RS-232s

Q *1. If I put a new upgraded PAL into my Multi-Pak Interface, will I lose the ability to run CoCo 1 and 2 programs?*

2. How can I hook up my Avatex 1200-bps modem (which I am currently using with a Deluxe RS-232 Pak via the Multi-Pak) directly to the 4-pin serial port on the CoCo 3?

3. Sometimes the Send Data light stays on when I am using my modem with the RS-232 Pak, and the terminal program hangs. I suspect the RS-232 Pak may be failing, and I want to check the terminal program and modem with the bit-banger port. What could be wrong with my RS-232 Pak?

Edward Stroh (COCO512K)
Hornton, Illinois

A 1. Upgrading the Multi-Pak Interface for the CoCo 3 will not affect the operation of any CoCo 1 or 2 software that already works on your CoCo 3. It *will* have an effect on the ability of the Multi-Pak to work with a few obscure, obsolete, ancient hardware cards that were made for the CoCo 1 and 2. For example, the CoCo Max joystick adapter, the PBJ Word Pak (non-RS models) and the original Microworks DS69 cards will not work with a Multi-Pak that has been upgraded for operation with the CoCo 3. Of course those cards would not work in a CoCo 3 to begin with because the port addresses conflict with those of the GIME chip. But now a Multi-Pak upgraded for CoCo 3 operation will no longer be able to be used with those cards and a CoCo 1 or 2. This is the only loss involved in such an upgrade. All commonly used and modern cards should still work fine with the Multi-Pak and with either the CoCo 1, 2 or 3.

2. Modems with standard DB-25 conectors can be hooked to the 4-pin serial port with the following cable:

CoCo 4-pin DIN	Modem DB-25
1	8
2	3
3	7
4	2

3. The first thing I would look for if the RS-232 Pak is failing is a defective 1488 or 1489 level-converter chip. These chips are "hooked to the outside world" and are the first to get zapped if some nasty juice comes down the line from the modem cable. However, your description of the problem makes me wonder if there is some software or subtle system-hardware problem completely separate from the RS-232 Pak.

Q A Q A Q A

Experimental Modification

In a document circulated on the CoCo mailing list on March 27, 1991, Charles C. Bundy, IV, describes the results of a fascinating experiment he performed on his CoCo 3. I have asked, and received, his permission to relay news of his work to readers of this column.

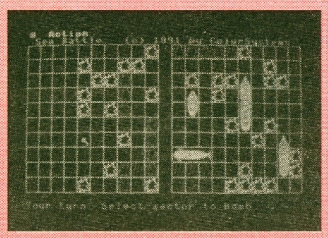
Charles noticed a difference in the way timing for the 74LS138 chip (which decodes address space for the ROMs and the *SCS and *CTS lines) is handled between the CoCo 1 and 2 and the CoCo 3. The 74LS138 is gated with the S2 line of the SAM chip and E-clock on the CoCo 1 and 2, as per Motorola's recommendation in its tech manual for the 74LS783 and 74LS785 (SAM) chip. This is, however, not the case for the 74LS138 chip in the CoCo 3. When Charles added this extra gating, all sparklies he had experienced with OS-9 when using an older (1986) GIME chip disappeared, his BLOB (Boot-List-Order Bug) problem disappeared, and a problem he had running his Performance Peripherals No-Halt disk controller with his Burke and Burke hard-drive interface was cured.

The "fix" that Charles performed is as follows: Take a 74LS02 (quad-NOR gate) and suitably mount and apply power to it. Tie High all inputs for three of its four gates. Leave the outputs of those gates unconnected. You have now in effect discarded three of the four NOR gates on the 74LS02 chip. Regarding the remaining NOR gate: Connect the S2 line from the GIME chip (available at Pin 3 of IC9, the 74LS138 chip) to one of the inputs of the remaining NOR gate on the 74LS02 you just installed. Connect the E-clock from the GIME chip (available at the intersection of R9, a 47-ohm resistor, and C10, a 39-pF capacitor) to the other input of the NOR gate. Now free either Pin 4 or Pin 5 (the *G2A or *G2B pin) of IC9. Note that both of these pins are grounded. The best way to do this is to destructively remove the 74LS138, clean all the holes, install a socket, and put in a new 74LS138 (or 74F138) with either Pin 4 or 5 bent up. Alternatively, if you are very

Product Review

Good Times With *OS-9 Level 2 Game Pack*

Mind games — not the kind played on people, but those played on the computer — have always been one of my favorite pastimes. The computer provides an ideal environment for many types of these games. Without the need for a human opponent or the hassles of setting up a game board, you can jump right in and start having fun; board-game pieces scattering across the floor are but a memory.



OS-9 Level 2 Game Pack provides many hours of entertainment with its offering of five challenging games: *CoCothello*, *CoCoYahtzee*, *KnightsBridge*, *Minefield*, and *Sea Battle*.

Sea Battle is the CoCo version of the game *Battleship* by Milton Bradley. The play field is represented by two 10-by-10 grids, on one of which you place four ships and one submarine. The computer hides its vessels on the other grid. The winner is the first player to sink all of his opponent's vessels by dropping bombs (explosion sound effects are included) on the correct coordinates.

The computer plays a good game, though its formula for searching for my ships' locations could be improved. In one instance, it had found my carrier and there was only one possible direction in which my carrier could fit. Yet the computer selected an incorrect coordinate on its next turn. Even with this slight handicap, the computer isn't a pushover. The game is fun and the graphics are good. [*Editor's note: According to Zack Sessions of ColorSystems, the logic error in* Sea Battle *has been corrected and updates have been sent to all registered users.*]

CoCothello, an *Othello* program, can be played against another person or the computer. (The original offering of CoCothello didn't provide the two-player option.) The computer asks if it should play its best strategy. Answering Yes earns you a stimulating contest. You're also prompted for color selection and whether or not you want to move first. Being asked which color to play when using a monochrome monitor may seem inappropriate, though after playing once, you'll understand the opening board setup, which is the same for every game. The game supports RGB, composite and monochrome monitors.

Minefield is a game played on an 11-by-14 grid. You start in the upper-left corner and must get to the lower-right corner to win. The difficulty is in finding a path to the lower-right corner without being blown up by a mine. You select how many mines are to be placed (randomly) on the grid — any number between 10 and 40. With each move, you're told how many adjacent squares contain mines. Using logic, and sometimes luck, you must cut a safe path to victory.

KnightsBridge is a board game that uses 14 chess knights — seven black and seven white. The game is played against the computer on a 7-by-7 grid. The knights are placed on the back rows of opposing sides of the board. The winner is the player who first captures five of the enemy's knights. Knights move the same as on a chess board. However, there is a catch: Which knight you or the computer may move is randomly selected.

CoCoYahtzee is, of course, Milton Bradley's *Yahtzee* in sheer sheep's clothing. The computer rolls the dice, and you select which dice to keep and which to roll again to make combinations amounting the highest point score possible. The rules are the same as those for the original game.

All of the games are entertaining. OS-9 Level II, a CoCo 3 with at least 256K, a disk drive, and a monitor are the only requirements. To get a game up and running is simple: Merge `stdfonts`, `stdptrs` and `stdpats_4` from the `SYS` directory of your OS-9 disk. Next, change the execution and data directories to the `CMDS` directory of the games disk. All you need to do then is type the filename of the particular game you want to play.

The manual explains how to create a bootable games disk and how to use the games as `GShell` (*Multi-Vue* type) applications. Icon and AIF files are supplied on the disk. However, neither *Multi-Vue* nor the *Multi-Vue* `WINDINT` module are required to play the games. Hard-drive procedures are also covered in the documentation.

I enjoyed playing *OS-9 Level 2 Game Pack*. Each game is well designed. This is a good mixture of games that will provide entertainment for a long time. (*ColorSystems, P.O. Box 540, 4616 Castle Hayne, Castle Hayne, NC 28429, 919-675-2426; $34.95.*)

— Jamie Hensen

dexterous with fine cutting pliers, you may be able to cut Pin 4 (or Pin 5) where it attaches to the circuit board, and have enough of a stub left to bend and solder a wire to. Feed the output of the NOR gate to Pin 4 or 5 of the 74LS138 that you just freed.

What you have done is gated the 74LS138 so that the ROMs are enabled only during the E-clock portion of the read cycle. Charles notes that the CoCo 3 Tech manual on Page 36 claims that the CoCo 3 is supplied with this property, but that this claim is wrong. Only after his fix, Charles states, will the ROM decoding be restricted to the E clock portion of the read cycle.

This fix is, as Charles very clearly notes in his original document, very experimental, and should be done only by hackers who are very comfortable with doing such modifications using the kind of rough guidelines I provide here. Preferably, it should also only be done by those who are experiencing subtle hardware problems such as sparklies, weird inexplicable incompatibilities, and persistent BLOB problems. I welcome reports from any intrepid experimenters who try this fix, regarding what, if any, improvements it made in their systems.

Martin H. Goodman, M.D., a physician trained in anesthesiology, is a longtime electronics tinkerer and outspoken commentator — sort of the Howard Cosell of the CoCo world. On Delphi, Marty is the SIGop of THE RAINBOW's CoCo SIG. His non-computer passions include running, mountaineering and outdoor photography. Marty lives in San Pablo, California.

Received and Certified

The following products have recently been received by THE RAINBOW, examined by our staff and issued the Rainbow Seal of Certification, your assurance that we have seen the product and have ascertained that it is what it purports to be.

CoCo Cassette #111, a variety of programs presented monthly for the CoCo 1, 2 and 3. This issue contains: *Personnel File*, a program for small-business owners to keep track of employees; *Quest of Chaos*, a text adventure; *Retirement Account*, a program to help plan your retirement account; *Alphabet Scrambler*, a CoCo 3 puzzle game; *Poker 3*, a CoCo 3 poker game; *Finance Bundle*, helps keep track of your savings and loans; *Silence Syndrome*, a text adventure; *Mr. Bill*, helps track your outstanding invoices; *Coast-To-Coast*, a truck driving game; and *Gopher 3*, a CoCo 3 game described as a cross between *Pac-Man* and *Dig-Dug*. *T & D Software, 2490 Miles Standish Dr., Holland, MI 49424, (616) 399-9468; $8.*

◆ **LSrcDbg**, is a source-level debugger/launcher utility that creates a better debugging environment for OS-9/68000 user-state programs written in C. It allows the program being debugged and the debugger to run on separate terminal screens, thus improving debugging efficiency. Requires an OS-9/68000 system (V2.2 and up), a secondary terminal device and port, and the source-level debugger, *SrcDbg* (V2.0 and up), from Microware. *Ark Systems USA, P.O. Box 23, Santa Clara, CA 95052, (408) 244-5358; $45.*

Rick's Treasure Chest — Unbelievable Offer #3, an offering of 20 programs ranging from education and games to print drivers and databases. The package consists of a manual and a two-disk set — one flippy and one floppy. Many of the programs are executable from a menuing program included on both sides of the flippy disk. Requires a CoCo 1, 2 or 3 and a disk drive. *Rick's Computer Enterprise, P.O. Box 276, Liberty, KY 42539, (606) 787-5783; $20.*

◆ **The Sound Library Volume One**, offers five digitized sound files to be used in conjunction with your BASIC or machine-language programs. A BASIC subroutine is included for loading and playing the sound files. The documentation provides loading instructions and explains how to copy sound files to another disk and how to call the sound routines. Requires a CoCo 3 and a disk drive. *Color Computing Software, 65 Oak Road, Canton, MA 02021; $6.95 plus $.75 S/H.*

Window Master V3.0, a point-and-click environment for the CoCo 3. Features a program launcher, file selection, disk and file maintenance, a print spooler, programmable function keys, multiple fonts, icons, pull-down menus and more. Requires a disk drive, a Tandy Hi-Res interface, and a joystick or mouse. *CER-COMP Ltd., 5566 Richochet Avenue, Las Vegas, NV 89110, (720) 452-0632; $69.95 plus $4 S/H.*

◆ First product received from this company

The Rainbow Seal of Certification is open to all manufacturers of products applicable to the Tandy Color Computer, regardless of whether or not those companies advertise in THE RAINBOW. By awarding the Seal, we certify the product exists — we have a sample copy and have examined it. However, this does not constitute any guarantee of satisfaction. As soon as possible, these products will be forwarded to reviewers for evaluation.

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* * * * *

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Feature Program

Master List: A Feature-packed Filer

While many multipurpose database programs are useful for storing address information, they are almost overkill for this application. Then, too, because they are designed for a broad spectrum of uses, they aren't easily fine-tuned for storing addresses or other card-file information.

Master List is specifically designed to be an address database. It offers features found in the major database programs along with some that aren't. The program runs on the 32-column screen and works with any Color Computer with at least 64K and one disk drive.

To set up *Master List*, first enter the BASIC programs shown in listings 1 through 3 and save them to a new formatted disk using the indicated filenames. Now run MLDATA, which creates a machine-language routine and saves it to disk.

To get *Master List* running, enter RUN"BOOT". This short program loads the machine-language routine from disk, displays the main screen, then runs the main program, MLIST.

At this point, eight data fields appear onscreen, along with several commands shown at the bottom of the screen. The fields and their intended uses are

NAME	person's last name
NAME	person's first name
CORP	a company name
ADRS	number and street
CITY	town or village
PROV	province or state; include zip
MISC	personal notes
TEL#	telephone number

Each of these eight data fields is 25 characters in length. Together the fields form a single database record. All the records together make up a file.

When *Master List* starts, you are prompted for the date. You can enter it in any format you want, but you must limit your entry to eight characters. The program then saves the date on Track 17, Sector 1 of the disk in Drive 0.

After you enter the date, *Master List* prompts you for the name of the file you want to open. If you press ENTER without typing a filename, the default filename, MLIST.DAT, is used.

When the file is opened (or the new file created), the field by which the file is sorted is indicated at the top of the screen. Just below this, in the center of the screen, is an indication of the total number of records in the file and the number of the record currently displayed. Use the right- and left-arrow keys to scroll through the records in a file.

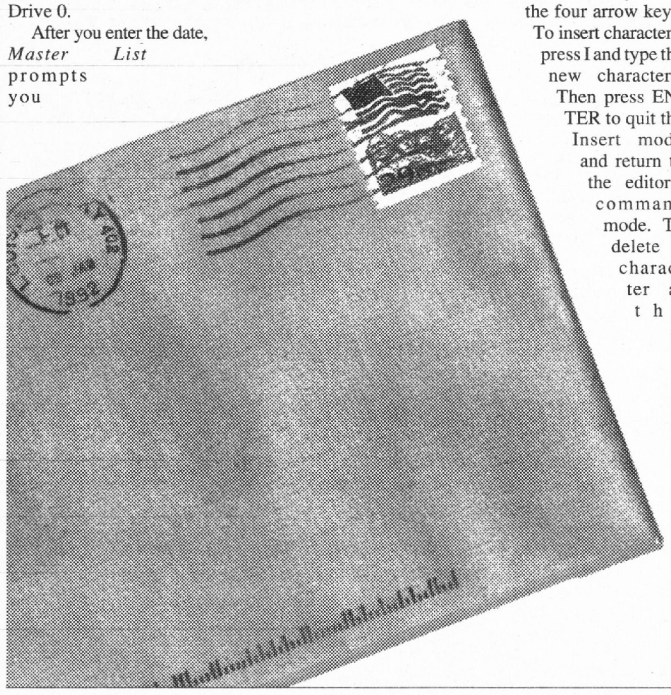
The command menu is displayed at the bottom of the screen. Actually there are two menus, and you toggle between them by pressing the space bar. When the menus flash, you can select a command. Do this by pressing the first letter of the command name. Following are descriptions of the *Master List* commands available from the first menu:

ADD — Use this command to add names to the file. When you select it, the screen clears and the record number is updated. Enter the appropriate information in each field, pressing ENTER after each line. When you have finished, the record is saved to disk and you are returned to the command mode. To abort the record, press BREAK before entering the last line of text.

DELete — When you pick this option, you are asked whether or not you want a selective deletion. If you press Y, *Master List* deletes all marked records (see the MARK command for details). If you press N at the prompt, *Master List* deletes only the currently displayed record.

The space previously used by a deleted record is not automatically freed — the empty record remains and wastes space in the file. Use the SORT command to eliminate this.

EDIT — Use the EDIT command to correct typing errors or update a record with new information. After you select this command, move around the data screen by using the four arrow keys. To insert characters, press I and type the new characters. Then press ENTER to quit the Insert mode and return to the editor's command mode. To delete a character at the cursor position, press D. To change existing characters, position the cursor over the first character to be changed and press C. Now type the new characters. Press ENTER to exit the Change mode.



If you press BREAK while using Insert, Delete or Change, the change you just made is undone. To abort the entire edit, leaving the contents of the entire record unchanged, press the space bar. To accept all changes made to the record, press ENTER while in the editor's command mode.

FIND — After you choose this command, select the field on which to search by using the up and down arrows, then press ENTER. Type the information (string) to be found and press ENTER. The search begins at the record just after the one being displayed.

If a match is found, that record is displayed. If not, you are asked to enter the search string again. To abort the FIND command, press BREAK.

PRINT — When you select the PRINT command, a submenu appears giving you five options. The print options are:

- Labels — prints to standard mailing labels.
- Send — allows you to send printer codes to the printer.
- Lists (1, 2 and 3):
  List 1 — full name and telephone
  List 2 — address, city and province
  List 3 — both List 1 and List 2

List 1, List 2 and List 3 print the information in "phone book" format. Use them to print on standard 8½-by-11-inch paper.

After you select one of these options, a second submenu appears allowing you to select which records to print. The options on this submenu are:

- File — prints the entire file.
- Markers — prints marked records.
- Record — prints only the currently displayed record.
- Search — prints records containing a specific search string and works just like the FIND command.

RECord — Use the REC command to jump to a specific record within the file.

SORT — This command is used to sort the records alphabetically; you select the field on which to sort. As mentioned before, another use of SORT is to eliminate empty records left behind by the DEL command. SORT works just like FIND except that you don't enter a search string.

The second *Master List* command menu, which you reach by pressing the space bar, offers six more commands. These commands are as follows:

fileNAME — Select this command to start working on a different database file. Type the name of the desired file (no filename extension is necessary) and press ENTER.

XFER — Use this command to transfer records between files without having to retype the data. When selected, XFER gives you two options: Use Transfer to *send data to* another file or Append to *receive data from* another file. After you make your selection, you are prompted for whether or not you want a selective XFER. If you press Y, all marked records are involved. If you press N, *all records following* the currently displayed record are transferred or appended. You are then prompted for the name of the second file.

MARK — Use MARK to indicate a group of records for printing, deleting or transfers. When MARK is selected, a submenu appears with the following options:

- Travel — allows you to move through the file (using the arrow keys) and calls up a second submenu with four new options:
  Mark — marks the current record
  Unmark — unmarks the current record
  Delete — deletes the current record
  Space bar — returns to previous menu
- Find — lets you locate every occurrence of a string and marks all corresponding records.
- Mark — marks the current record.
- Unmark — unmarks the currently displayed record.
- Remove — removes all markers from the file.

DISK — This command shows the directory of the disk in the specified drive.

RESTORE — The RESTORE command can be used to restore all records that have been previously deleted, assuming their slots haven't been removed by SORT.

QUIT — Use this command to exit *Master List*. The program itself is not erased from memory.

A final note of caution regarding the use of *Master List* is in order: The BREAK key is not fully trapped. Other than those situations indicated above, pressing BREAK to abort a command causes the program to stop. To get *Master List* running again, just enter RUN. You'll be prompted for the filename but not the date. However, any data not saved to disk *before* you pressed BREAK will be lost.

I hope you enjoy using *Master List*, and I believe you will find it a powerful addition to your Color Computer library.

Peter Masterson is a consultant with Hexagon Computer Systems and has been using the Color Computer for over six years. He may be contacted at 1280 Cahill Drive, #7, Ottawa, ON K1V 9R1, Canada.

CoCo 3

Listing 1: MLDATA

```
1 'MASTER LIST
2 'WRITTEN BY PETER MASTERSON
3 'COPYRIGHT (C) FEBRUARY 1992
4 'BY FALSOFT, INC.
5 'RAINBOW MAGAZINE
10 CLS
20 FOR X=30000 TO 31052:READ A:
POKE X,A:NEXT
30 FOR X=32000 TO 32184:READ A:
POKE X,A:NEXT
40 SAVEM"MLIST",30000,32184,0
50 END
1000 DATA 23,1,156,198,4,166,132
,136,64,167,128,90,38,247,22,1,1
91,23,1,145,58,48,31,166,132,129
,32,16,38,1,173,48,31,90,38,243,
95,22,1,164,142,4,78,198,3,166,1
32,136,64,167
1010 DATA 128,90,38,247,22,1,151
,23,1,105,16,142,4,134,198,25,16
6,128,23,1,105,167,160,90,38,246
,16,140,5,127,16,39,1,124,198,25
,49,39,22,255,231,23,1,71,16,142
,27,88,166,160
1020 DATA 129,96,16,39,1,102,23,
1,74,167,128,32,241,23,1,49,58,4
8,31,166,132,129,32,16,39,1,77,4
8,31,90,38,243,23,1,30,16,142,4,
134,198,25,166,160,23,1,37,167,1
28,90,38
1030 DATA 246,16,140,5,127,16,39
```

```
,1,49,198,25,49,39,32,232,134,96
,16,142,4,134,198,25,167,160,90,
38,251,16,140,5,127,16,39,1,22,4
9,39,198,25,32,237,142,4,0,16,14
2,31,64,166
1040 DATA 128,167,160,140,6,0,38
,247,22,0,253,142,4,0,16,142,31,
64,166,160,167,128,140,6,0,38,24
7,22,0,234,79,183,1,213,16,190,1
,214,246,1,216,31,35,51,197,255,
1,220,51,95
1050 DATA 255,1,228,206,0,0,167,
164,142,27,88,134,255,167,164,17
3,159,160,0,39,250,129,8,39,20,1
29,13,39,37,129,3,39,67,129,21,1
6,39,0,68,129,32,37,228,32,92,17
,131,0,0,39
1060 DATA 220,23,0,142,134,96,16
7,164,49,63,51,95,48,31,32,201,1
34,96,167,164,49,33,16,188,1,220
,37,248,16,188,1,224,16,44,0,70,
23,0,107,49,39,16,191,1,214,206,
0,0,32,144
1070 DATA 134,1,183,1,213,32,49,
17,131,0,0,16,39,255,156,23,0,78
,134,96,167,164,49,63,51,95,48,3
1,16,188,1,214,38,242,22,255,130
,16,188,1,220,16,39,255,122,167,
128,141,33,167
1080 DATA 160,51,65,22,255,111,2
55,1,217,134,96,167,132,32,49,18
9,179,237,31,1,57,23,255,247,230
,132,16,174,2,31,33,57,129,64,44
,2,139,64,57,129,96,37,251,128,6
4,57,134,197,255,1
1090 DATA 232,254,1,220,167,196,
254,1,232,57,79,189,180,244,57,0
,142,4,134,206,4,158,255,1,196,2
3,1,180,23,1,220,32,3,23,1,172,1
73,159,160,0,16,39,1,233,129,3,1
6,39,1,172
1100 DATA 129,32,16,39,2,25,129,
13,16,39,2,24,129,73,16,39,0,41,
129,75,16,39,0,198,129,67,16,39,
0,214,129,68,16,39,1,116,32,204,
23,1,6,32,199,23,1,20,22,255,193
,23
1110 DATA 1,33,32,185,23,1,37,32
,180,23,1,96,48,31,191,1,194,48,
1,23,0,114,193,25,16,39,255,161,
16,188,1,194,16,47,0,155,198,96,
31,35,49,33,166,196,129,127,34,2
22,167,164
1120 DATA 231,196,51,95,49,63,17
,179,1,194,16,39,0,2,32,232,23,1
,39,173,159,160,0,16,39,255,248,
129,3,16,39,1,39,129,13,16,39,0,
24,129,8,16,39,0,30,23,1,17,188,
1
1130 DATA 196,16,39,255,220,129,
32,37,216,167,132,32,157,23,0,21
7,23,0,245,23,1,29,22,255,67,23,
0,236,48,31,23,0,200,22,255,186,
16,190,1,196,198,25,166,164,129,
96,38,9,49,63
1140 DATA 90,16,39,255,34,32,241
,193,25,16,39,0,194,16,188,1,194
,16,47,0,186,57,31,19,198,96,166
,196,129,128,16,34,255,5,231,192
,32,244,22,255,1,23,0,170,173,15
9,160,0,39,250
1150 DATA 129,13,16,39,255,238,1
29,8,16,39,0,25,129,3,16,39,0,16
0,23,0,150,188,1,196,44,224,129,
32,37,220,167,128,23,0,129,32,21
3,23,0,51,23,0,121,32,205,23,0,5
2,23,0
1160 DATA 113,32,243,23,0,53,48,
136,224,51,200,224,23,0,54,23,0,
96,23,0,136,57,23,0,34,48,136,32
,51,200,32,23,0,35,23,0,77,23,0,
117,57,23,0,15,48,31,23,0,20,57
1170 DATA 23,0,6,48,1,23,0,11,57
,23,0,52,191,1,194,254,1,196,57,
166,132,129,128,34,4,255,1,196,5
7,190,1,194,57,31,19,198,96,31,5
0,49,33,166,164,129,128,34,10,16
7,196,231
1180 DATA 164,49,33,51,65,32,240
,57,23,255,228,22,254,81,166,132
,136,64,167,132,57,129,64,44,2,1
39,64,57,16,142,5,166,31,19,190,
1,196,48,136,232,198,25,166,160,
167,128,90,38,249,31
1190 DATA 49,23,255,216,22,254,4
1,23,255,210,254,1,196,51,200,22
7,198,30,16,142,5,161,166,192,16
7,160,90,38,249,23,255,188,57,20
6,1,85,16,142,35,40,49,63,38,252
,166,196,129,247,39,11
1200 DATA 51,65,17,131,1,89,38,2
42,22,253,243,17,131,1,85,16,39,
254,31,17,131,1,86,16,39,254,28,
17,131,1,87,16,39,254,26,17,131,
1,88,16,39,254,23,134,1,183,1,20
3,23,255
1210 DATA 119,57,96,198,2,158,13
6,206,109,96,247,1,228,23,0,113,
92,247,1,228,206,113,72,23,0,103
,31,50,198,11,166,160,39,71,129,
255,39,71,23,0,114,23,0,118,167,
128,193,4,38,2
1220 DATA 48,1,90,38,231,49,34,1
66,164,95,92,16,142,109,96,49,16
6,166,164,129,192,37,243,48,1,15
9,136,79,52,86,189,189,204,53,86
,48,1,31,50,51,200,32,49,168,32,
48,2,16,140,114
1230 DATA 72,37,179,32,4,48,30,3
2,234,246,1,228,92,247,1,228,193
,12,39,64,206,113,72,23,0,3,22,2
55,153,16,190,192,6,134,2,167,16
4,182,9,90,167,33,134,17,167,34,
231,35,239,36
1240 DATA 173,159,192,4,57,129,6
4,44,2,139,64,57,140,5,255,37,25
0,52,102,173,159,160,0,39,250,18
9,169,40,142,4,0,53,102,57,159,1
36,57,0
```

Listing 2: BOOT

```
1 'MASTER LIST
** WRITTEN BY PETER MASTERSON
2 'COPYRIGHT (C) FEBRUARY 1992
** BY FALSOFT, INC.
** RAINBOW MAGAZINE
3 CLEAR3000,29999
5 ST$=CHR$(202)+STRING$(30,32)+C
HR$(197):LOADM"MLIST"
6 DATA NAME,NAME,CORP,ADRS,CITY,
PROV,MISC,TEL#
7 FOR X=1TO8:READ F$(X):NEXT
10 DEFUSR0=30017:DEFUSR1=30113:
   DEFUSR2=30091:DEFUSR3=30132:
   DEFUSR4=30000:DEFUSR5=30057
12 M$(2,1)="aDD dEL eDIT fIND pR
INT rEC sOR"
16 POKE150,41
18 CLS:PRINTTAB(10)"MASTER LIST"
:PRINT:PRINTTAB(1)"PROGRAMMED BY
 PETER MASTERSON":PRINTSTRING$(3
2,195):
19 EXEC30165:X=128
20 FOR Z=1TO8
22 PRINT@X,CHR$(202)F$(Z)CHR$(20
2)STRING$(25,32)CHR$(197);:X=X+3
2
23 NEXT:PRINT@383,CHR$(197);
30 PRINTSTRING$(32,195);:PRINT@4
16,ST$;:PRINTSTRING$(32,195);:SE
T(0,24,5):SET(63,24,5):SET(0,28,
5):SET(63,28,5):SET(10,24,5)
32 PRINT@480,M$(2,1);:POKE1535,8
4:POKE7999,1
40 PRINT@417,"FILE"CHR$(202);
41 SET(10,28,5):EXEC30192
50 CLOSE:RUN"MLIST"
```

Listing 3: MLIST

```
1 'MASTER LIST
2 'WRITTEN BY PETER MASTERSON
3 'COPYRIGHT (C) FEBRUARY 1992
** BY FALSOFT, INC.
** RAINBOW MAGAZINE
4 FILES 2,402
5 ST$=CHR$(202)+STRING$(30,32)+C
HR$(197):BE$="L100O4C":TM=20:MN=
1:CL=76:TA$=STRING$(10,32)
6 DIM MO$(12),A$(100),A(100)
7 FOR X=1TO8:READ S$(X):NEXT:
  FOR X=1TO8:READ F$(X):NEXT
10 DEFUSR0=30017:DEFUSR1=30113:
   DEFUSR2=30091:DEFUSR3=30132:
   DEFUSR4=30000:DEFUSR5=30057
12 M$(1,1)="ADD DEL EDIT FIND PR
INT REC SOR":M$(1,2)="aDD dEL eD
IT fIND pRINT rEC sOR":M$(2,1)="
NAME XFER MARK DISK RESTORE QUI"
:K$(1)="ADEFPRS ":M$(2,2)="nAME
xFER mARK dISK rESTORE qUI":K$(2
)="NXMDRQ "
20 EXEC 30211
22 IF PEEK(450)=0 THEN GOSUB1300
:POKE 450,1
30 S=1446:E=1471:A$="":MX=25:PRI
NT@422,"";:GOSUB6000:IF BK=1THEN
PRINT@423,STRING$(14,32);:PLAY B
E$:GOTO30
32 IF LEN(A$)=0THEN B$="MLIST/DA
T":A$="MLIST   /DAT":GOTO37
```


PHOTON

The critics will be **raving** about this strategy game! Based on an original concept by author Jeff Steidel, *Photon* is an addictive time-muncher in the spirit of *Lemmings*™ and *Tetris*™. Match wits with Ludevide, the evil power droid, as you reason your way through over 60 devious levels. The numerous original music scores, digitized speech and sound effects, and pleasing animation and graphics enrich *Photon* to make it an unparalleled gaming experience. Soon to be released on a variety of computer platforms, the CoCo Community is lucky enough to be given first glance at this fantastic game! Req. 128k CoCo-3, disk drive, and joystick.

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BASIC COMMANDS SUPPORTED

1. I/O commands
   CLOSE CLOADM CSAVEM DIR DRIVE DSKI$ DSKO$ FIELD FILES GET INPUT KILL LSET OPEN PRINT RSET USING LINEINPUT
2. Program control commands
   CALL DEFUSR END EXEC FOR NEXT GOSUB GOTO IF THEN ELSE ERROR ON RETURN STOP USR
3. Functions
   ABS ASC ATN COS CVN EOF EXP FIX HPOINT INSTR INT LEN LOG LPEEK LOC LOF PEEK POINT PPOINT RND SGN SIN SQR TAN TIMER VAL VARPTR
4. String functions
   CHR$ INKEY$ LEFT$ MID$ MKN$ RIGHT$ STR$ STRING$
5. Graphic/Screen commands
   ATTR COLOR CLS CIRCLE DRAW HCOLOR HSCREEN HDRAW HLINE HPAINT HPRINT HRESET HCIRCLE HCLS HSET JOYSTK LINE LOCATE PALETTE PAINT PCLEAR PCLS PLAY PMODE PRESET PSET RESET SCREEN SET SOUND WIDTH GET
6. Other commands
   DATA DIM MOTOR POKE LPOKE RESTORE READ REM TRON TROFF TAB VERIFY

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```
34 B$=A$:A=INSTR(A$,"/"):IF A=0T
HEN A=INSTR(A$,"."):IF A=0THEN G
=8-LEN(A$):A$=A$+STRING$(G,32)+"
/DAT":GOTO37
36 I=8-A:C$=MID$(A$,1,A-1)+STRIN
G$(I,32)+"/"+MID$(A$,A+1,3):A$=C
$
37 FO$=A$
38 IF B$=FI$ THEN68 ELSE FF$=B$
40 IF RT=1 THEN RETURN
50 CLOSE:PRINT@422,B$;:EXEC 3016
5:PRINT@422,B$;:OPEN"D",#1,B$,20
1:FIELD#1,201 AS R$:SO$=MID$(FO$
,1,8)+"/TMP":FI$=B$
52 LO=LOF(1)-1:IF LO<=0 THEN RC=
0:LO=0:LSET R$="1":PUT#1,1 ELSE
RC=1:B=1
53 PRINT@64,STRING$(30,32)
54 DSKI$ 0,17,1,A$,B$:DT$=MID$(A
$,1,8):IF MID$(DT$,1,1)=CHR$(255
)THEN DT$="MM/DD/YY"
55 M=VAL(MID$(DT$,1,2)):I=VAL(MI
D$(DT$,4,2)):I$=STR$(I):DA$=RIGH
T$(I$,LEN(I$)-1):F9$=MO$(M)+" "+
DA$+", 19"+MID$(DT$,7,2)
56 GET#1,1:SF$=MID$(R$,1,1):SF=V
AL(SF$):DL$=MID$(R$,2,3):DL=VAL(
DL$)
57 IF DL=LOF(1)-1 THEN RC=0:LO=
LOF(1)-1:GOSUB5030 ELSE GOSUB500
0
58 GET#1,RC+1
60 PRINT@0,"SORTED BY "S$(SF):PR
INT@24,DT$:GOTO70
68 RT=0:PRINT@417,STRING$(30,32)
;:PRINT@417,"FILE"CHR$(202);FI$;
:BK=0:RT=0:SET(10,28,5)
70 FOR X=1TO TM:PRINT@480,M$(MN,
1);:GOSUB80:NEXT:FOR X=1TO TM:PR
INT@480,M$(MN,2);:GOSUB80:NEXT:
GOTO70
72 GOTO68
80 POKE344,255:IF PEEK(344)=247
THEN RC=RC+1:B=1:GOSUB5000
82 POKE343,255:IF PEEK(343)=247
THEN RC=RC-1:B=-1:GOSUB5000
84 Z$=INKEY$:IF Z$=""THEN RETURN
86 IF RT=1 THEN RETURN
90 I=INSTR(K$(MN),Z$):IF I=0THEN
RETURN
92 PRINT@480,M$(MN,1);
94 RR=RC:ON MN GOTO95,97
95 ON I GOSUB100,200,300,400,500
,800,900,950
96 GOTO98
97 ON I GOSUB1000,1100,1200,1500
,1400,1900,950
98 IF MC=0THEN68ELSE MC=0:GOTO70
100 PRINT@480,"add";
101 IF LOF(1)>101 THEN GOSUB5040
:PRINT@417,"100 RECORDS MAX - PR
ESS [ENTER]";:EXEC44539:RETURN
102 RR=RC:GOSUB5040:PRINT@423,"U
SE [BREAK] TO ABORT";:LO=LO+1:RC
=LO
105 GOSUB5030
110 S=1158:E=1406:MX=25:EXEC3016
5:GOSUB6000:IF BK=0THEN120ELSE R
C=RR:LO=LO-1:IF LO=0 THEN EXEC30
165
115 GOSUB5000:RETURN
120 A$=STRING$(200,32):X=USR3(VA
RPTR(A$)):IF RT=1 THEN LO=LOF(1)
-1:RETURN ELSE LSET R$=A$:PUT#1,
LOF(1)+1:GOSUB5030:RETURN
200 PRINT@484,"del";:GOSUB5040:P
RINT@425,"SELECTIVE (Y/N)";:K$="
YN ":GOSUB5050
205 ON I GOSUB230,220,68
210 RETURN
220 E$=R$:MID$(E$,201,1)="D":LSE
T R$=E$:PUT#1,RC+1:RC=RC+1:DL=DL
+1:GOSUB250:GOSUB5000:LSET R$=SF
$+RM$+DL$:PUT#1,1
225 RETURN
230 FOR E=2 TO LO+1:GET#1,E:IF M
ID$(R$,201,1)="M"THEN RC=E-2:E$=
R$:MID$(E$,201,1)="D":LSET R$=E$
:PUT#1,E:DL=DL+1
235 NEXT
240 GOSUB250:LSET R$=SF$+DL$:PUT
#1,1
245 RETURN
250 A$=STR$(DL):DL$=MID$(A$,2,LE
N(A$)):IF DL=LOF(1)-1 THEN RC=0:
GOSUB5030:EXEC30165
252 RETURN
300 PRINT@488,"edit";:POKE459,0:
W$=STRING$(200,32):X=USR3(VARPTR
(W$)):EXEC30466:IF PEEK(459)=1TH
EN X=USR5(VARPTR(W$)):RETURN ELS
E X=USR3(VARPTR(W$)):LSET R$=W$:
PUT#1,RC+1:RETURN
400 PRINT@493,"find";
405 GOSUB5040:PRINT@422,"SELECT
FIELD TO FIND";
407 GOSUB5060:IF BK=1THEN RETURN
410 SET(10,28,5)
415 GOSUB5040:PRINT@417,F$(LI)CH
R$(202);:SET(10,28,5):MX=25:S=14
46:E=S+MX-1:GOSUB6000:IF BK=1  O
R RT=1THEN RETURN
416 IF RT=1 THEN RETURN
420 IF RC=LO THEN NF=1:RETURN
ELSE FOR X=RC+2 TO LO+1:GET#1,X
422 I$=MID$(R$,25*LI-24,25):IF I
NSTR(I$,A$)<>0 AND MID$(R$,201,1
)<>"D" THEN RC=X-1:GOSUB5025:RET
URN
424 NEXT
426 GOSUB5040:IF RT=1 THEN NF=1:
RETURN ELSE PRINT@420,"NOT FOUND
 - PRESS [ENTER]";:EXEC44539:GOT
O415
500 SS=SF:RT=1:PRINT@498,"print"
;:GOSUB5040
510 PRINT@417,"L]ABELS S]END LIS
TS([1][2][3])";:K$="LS123 ":GOSU
B5050:IF I=6 THEN SF=SS:GOTO98 E
LSE TY=I
512 IF TY=2 THEN630
520 GOSUB5040:PRINT@417,"F]ILE M
]ARKERS R]ECORD S]EARCH";:K$="FM
RS ":GOSUB5050:IF I=5THEN510ELSE
 WH=I
522 IF TY>2 AND WH<>3 THEN PRINT
#-2,FI$;STRING$(20,32);"SORTED B
Y "S$(SF)STRING$(20,32);DT$:PRIN
T#-2,CHR$(10)
526 GOSUB5040:PRINT@426,"PRINTIN
G...";
530 ON WH GOSUB 550,560,540,570
532 GOTO 510
540 FOR L=1 TO 8:P=L*25-24:I$=MI
D$(R$,P,25):X=USR0(VARPTR(I$)):
L$(L)=MID$(I$,1,X):NEXT:N1$=L$(2
)+" "+L$(1):N2$=L$(1)+" "+L$(2)
542 ON TY GOSUB 580,,640,650,660
545 RETURN
550 FOR O=2 TO LOF(1):GET#1,O:
RC=O-1:GOSUB5000:GOSUB540
552 NEXT:GOTO510
560 FOR O=2 TO LOF(1):GET#1,O:
IF MID$(R$,201,1)="M"THEN RC=O-1
:GOSUB5000:GOSUB 540
562 NEXT:GOTO510
570 GOSUB405
572 AA$=A$:PO=LI*25-24:FOR O=1 T
O LOF(1):GET#1,O:GI$=MID$(R$,PO,
25):I=INSTR(GI$,AA$):IF I<>0 THE
N RC=O-1:GOSUB5000:GOSUB540
574 NEXT O:GOTO510
580 IF LEN(L$(3))<>0 THEN PRINT#
-2,L$(3):PRINT#-2,"c/o "N1$:GOTO
584
582 PRINT#-2,N1$
584 FOR R=4TO7:PRINT#-2,L$(R):NE
XT:PRINT#-2:RETURN
630 GOSUB5040:PRINT@417,"PRINTER
 CODES:"; :S=PEEK(136)*256+PEEK(
137):E=S+25:M=25:GOSUB6000:IF BK
=1 THEN510 ELSE A=VAL(A$):PRINT#
-2,CHR$(A);
632 GOTO 630
639 'list one
640 IF SF=1 THEN A$(1)=N2$:A$(2)
=L$(8) ELSE IF SF=8 THEN A$(1)=L
$(8):A$(2)=N1$ ELSE A$(1)=N1$:A$
(2)=L$(8):SF=2
642 GOSUB670:I=50-LEN(A$(1)):PRI
NT#-2,A$(1);STRING$(I,46);A$(2)
644 NP=NP+1:RETURN
649 'list two
650 P=2:IF SF<4 OR SF>6 THEN A$(
1)=L$(4):SF=4 ELSE A$(1)=L$(SF)
652 IF SF=4 THEN A$(2)=L$(5):A$(
3)=L$(6):GOTO656
653 IF SF=5 THEN A$(2)=L$(6):A$(
3)=L$(4):GOTO656
654 IF SF=6 THEN A$(2)=L$(4):A$(
3)=L$(5)
656 GOSUB670:FOR Z=1 TO 2:I=25-L
EN(A$(Z)):PRINT#-2,A$(Z);STRING$
(I,46);:NEXT:PRINT#-2,A$(3):NP=N
P+1:RETURN
659 'list three
660 SF=2:GOSUB640:GOSUB650:SF=SS
:PRINT#-2," ":RETURN
670 IF TY=5 THEN RETURN
672 IF MID$(A$(1),1,1)<>0$ THEN
PRINT#-2," ":NP=NP+1:O$=MID$(A$(
1),1,1)
674 RETURN
800 PRINT@504,"rec";:LL=LO
810 GOSUB5040:PRINT@417,"RECORD
NUMBER 1 TO"LL">";:S=PEEK(136)*2
56+PEEK(137):E=S+3:MX=3:GOSUB600
0:IF BK=1THEN RETURN ELSE A=VAL(
A$):IF A<1 OR A>LL THEN810
815 IF RT=1THEN RETURN
820 RC=A:GOSUB5000:GOTO68
900 BK=0:TR=0:PRINT@508,"sor";:P
OKE1535,20:GOSUB5040:P=0:PRINT@4
22,"SELECT FIELD TO SORT";:GOSUB
5060:IF BK=1  THEN RETURN
902 LL=LOF(1)
905 CLOSE#2:OPEN"D",#2,SO$,201:
FIELD#2,201 AS SG$
910 GOSUB5040:PRINT@428,"READING
...";
911 A$(1)="":X=2
912 GET#1,X:IF MID$(R$,201,1)="D
"THEN A$(X)=CHR$(255) ELSE A$(X)
=MID$(R$,25*LI-24,25)
913 IF X<LL THEN X=X+1:GOTO912
914 PRINT@428,"SORT";
920 X=1
922 X=X+1
924 IF X>LL THEN 940
926 IF A$(X)=CHR$(255)THEN922
928 FOR Y=1 TO LL
930 IF A$(Y)<A$(X) THEN X=Y
932 NEXT
934 P=P+1:A(P)=X:A$(X)=CHR$(255)
:GOTO920
940 PRINT@428,"WRIT";
942 FOR Z=2 TO LL:B=A(Z): IF B=0
 THEN 944 ELSE IF B=-1 THEN 94
ELSE GET#1,B:LSET SG$=R$:PUT#2,Z
:
944 NEXT
946 A$=STR$(SF):B$=MID$(A$,2,1):
LSET R$=B$:PUT#2,1:A$=STR$(LI):
B$=MID$(A$,2,LEN(A$)):LSET SG$=B
$+RM$:PUT#2,1:CLOSE:KILL FO$:REN
AME SO$ TO FO$:A$=FI$:SF$=B$
948 GOSUB5040:SET(10,28,5):PRINT
@417,"FILE"CHR$(202);FI$;:PRINT@
508,"SOR";:POKE1535,84:B$=FI$:
GOTO50
950 MC=1:MN=MN+1:IF MN=3THEN MN=
1
952 DL=0:DL$=" ":RETURN
1000 PRINT@422,STRING$(25,32);:
PRINT@480,"name";:GOSUB30:RETURN
1100 PRINT@485,"xfer";:GOSUB5040
1110 PRINT@421,"[T]RANSFER OR [A
]PPEND";:K$="TA ":GOSUB5050:IF I
=3 THEN RETURN ELSE CO=I
1112 GOSUB5040:PRINT@425,"SELECT
IVE (Y/N)";:K$="YN ":GOSUB5050:
IF I=3THEN1110 ELSE SL=ABS(I-2)
1114 SC=1:GOSUB5090
1116 Y=1:ON CO GOTO 1120,1150
1118 RETURN
1120 IF SL=1THEN B=1 ELSE B=RC
1122 FOR T=B TO LOF(1)-1:RC=T:GO
SUB 5000:IF SL=0THEN1124 ELSE IF
 MID$(R$,201,1)<>"M"THEN1128
1124 IF MID$(R$,201,1)="D"THEN11
28
1126 Y=Y+1:LSET H$=R$:PUT#2,Y
1128 NEXT:F$=SF$:LSET H$=F$:PUT#
2,1:RETURN
1150 FOR T=2 TO LOF(2):GET#2,T:I
F SL=0 THEN 1152 ELSE IF MID$(H$
,201,1)<>"M"THEN1156
1152 IF MID$(H$,201,1)="D"THEN11
56
1154 LSET R$=H$:PUT#1,LOF(1)+1:
LO=LO+1:RC=LO:GOSUB5000
1156 NEXT:LSET R$=SF$:PUT#1,1
1158 RC=1:LO=LOF(1)-1:GOSUB5000:
RETURN
1200 NF=0:RT=1:PRINT@490,"mark";
:GOSUB5040
1210 PRINT@417,"TRAVEL FIND MARK
 UNMARK REMOVE";
1212 K$="TFMUR ":GOSUB5050:IF I=
6 THEN 98
1214 ON I GOSUB 1220,1240,1250,
1260,1270
1216 GOTO1210
1220 RT=1:GOSUB5040:PRINT@417,"M
]ARK U]NMARK  D]EL [SPC]ABORT";
1222 GOSUB80
1224 I=INSTR("MUD ",Z$):IF I=0
THEN1222
1226 IF Z$="D" THEN GOSUB220:GOT
O1222
1228 IF Z$=" " THEN 1200
1230 IF Z$="M"  THEN GOSUB1250
1232 IF Z$="U" THEN GOSUB1260
1234 GOTO1222
1240 GOSUB407
1242 GOSUB420:IF NF=1 THEN1244
ELSE IF BK=1 THEN 98 ELSE E$=R$:
IF MID$(R$,201,1)="M" THEN 1242
ELSE MID$(E$,201,1)="M":LSET R$=
E$:PUT#1,RC+1:EXEC30040:IF RC>=L
O THEN 1244 ELSE 1242
1244 RETURN
1250 IF MID$(R$,201,1)="M"THEN
RETURN ELSE E$=R$:MID$(E$,201,1)
="M":LSET R$=E$:PUT#1,RC+1:GOSUB
5000:RETURN
1260 IF MID$(R$,201,1)=" "THEN
RETURN ELSE LSET R$=LEFT$(R$,200
):PUT#1,RC+1:EXEC30040:RETURN
1270 GOSUB5040:PRINT@429,"REMOVE
";
1272 FOR U=RC+1 TO LOF(1):GET#1,
U: IF MID$(R$,201,1)="M" THEN LS
ET R$=LEFT$(R$,200):PUT#1,U:RC=U
-1:GOSUB5000
1274 NEXT
1276 RETURN
1300 PRINT@232,"TODAY'S DATE PLE
ASE";
1310 PRINT@417,"DATE";:S=1446:MX
=25:PRINT@422,STRING$(25,32);:PR
INT@422,"";:GOSUB6000
1312 PRINT@232,STRING$(20,32);:
PRINT@422,STRING$(24,32);:PRINT@
417,"FILE";
1320 DSKO$ 0,17,1,A$,STRING$(128
,255):PRINT@24,A$;:DT$=A$:RETURN
1399 GOTO4999
1400 PRINT@500,"restore";
1410 FOR U=2 TO LOF(1):GET#1,U
1412 IF MID$(R$,201,1)="D"THEN
LSET R$=LEFT$(R$,200):PUT#1,U:
RC=U-1:GOSUB5000
1414 NEXT
1420 DL=0:DL$=" ":LSET R$=SF$+RM
$:PUT#1,1:RETURN
1500 POKE30197,33:POKE30198,72:
EXEC30192:PRINT@495,"disk";
1510 GOSUB5040:PRINT@417,"DRIVE
NUMBER:";:S=PEEK(136)*256+PEEK(1
37):MX=17:GOSUB6000:IF BK=1 THEN
 RETURN
1520 A=VAL(A$):CLS:PRINT@5,"- DR
IVE"A"DIRECTORY -":PRINT:OD=PEEK
(&H95A):DRIVE A:EXEC32000:PRINT:
PRINTCHR$(8)FREE(A)"FREE GRANS."
1522 PRINT@489,"PRESS [ENTER]";:
EXEC44539:DRIVE OD:POKE30216,33:
POKE30217,72:EXEC30211
1524 POKE 30216,31:POKE30217,64:
     POKE 30197,31:POKE30198,64
1526 RETURN
1800 EXEC44539:END
1900 CLS:PRINT@237,"QUIT":END
4999 EXEC44539:CLS:LIST
5000 IF LO=0THEN5030
5010 IF RC<1 THEN RC=LO:GOTO5020
5012 IF RC>LO THEN RC=1
5020 GET#1,RC+1:I$=MID$(R$,201,1
):IF I$="D"THEN DE=1:RC=RC+B:GOT
O5000
5025 DE=0:X=USR5(VARPTR(R$))
5030 PRINT@71,"RECORD ";:PRINTUS
ING"###";RC;:PRINT" OF ";:PRINTU
SING"###";LO:IF MID$(R$,201,1)="
M"THEN EXEC30040
5035 RETURN
5040 PRINT@417,STRING$(30,32);:R
ESET(10,28):RETURN
5050 Z$=INKEY$:IF Z$=""THEN5050
5052 I=INSTR(K$,Z$):IF I=0THEN50
50
5054 RETURN
5060 X=1153:LI=1
5062 Z=USR4(X):Y=X
5063 FOR W=1TO15:NEXT
5064 Z$=INKEY$:IF Z$=" "THEN BK=
1:Z=USR4(X):RETURN
5065 IF Z$=CHR$(13)THEN Z=USR4(X
):RETURN
5066 IF PEEK(341)=247 THEN X=X-3
2:LI=LI-1:GOTO5072
5068 IF PEEK(342)=247 THEN X=X+3
2:LI=LI+1:GOTO5072
5070 GOTO5064
5072 IF LI<1 THEN LI=8:X=1377
5074 IF LI>8 THEN LI=1:X=1153
5080 Z=USR4(Y):GOTO5062
5090 GOSUB5040:SET(10,28,5):PRIN
T@417,"FILE"CHR$(202);:RT=1:GOSU
B30:CLOSE#2:OPEN"D",#2,A$,201:FI
ELD#2,201 AS H$:IF SC=1 THEN RET
URN ELSE IF LOF(2)=0THEN CLOSE:K
ILL A$:OPEN"D",#1,FI$,201:FIELD#
1,201 AS R$:GOTO5090 ELSE FF$=A$
:RETURN
6000 BK=0:A=S:GOSUB6020:POKE470,
M:POKE471,L:A=E:GOSUB6020:POKE48
0,M:POKE481,L:POKE472,MX
6010 EXEC30230:LE=PEEK(474):IF P
EEK(469)=1 THEN POKE S+LE,96:BK=
1:RETURN ELSE A$=STRING$(LE,32):
 X=USR2(VARPTR(A$)):RETURN
6020 M=INT(A/256):L=A-(256*M):
RETURN
7010 DATA LAST NAME,FIRST NAME,C
ORPERATION,ADDRESS,CITY/TOWN,PRO
VINCE,MISC INFO,PHONE#
7012 DATA NAME,NAME,CORP,ADRS,CI
TY,PROV,MISC,TEL#
```

Feature Program

Lost and Found:

An OS-9 File Finder

Where in the world did you put that letter you wrote last summer to your Aunt Esmerelda about her health insurance? Is it in the directory with family correspondence? Or did you put it in the directory with the medical records? Perhaps it's in with the insurance data . . . or maybe the financial stuff.

In the June 1989 issue of THE RAINBOW, Dale Puckett described a recursive BASIC09 utility that helps users who find themselves in such a dilemma. *Find* searches the OS-9 directory tree to help you locate files that are "lost" somewhere down among the many branches.

One of the beauties of OS-9 is its ability to perform the same function in different ways. My version of *Find* is written in machine language and provides a big speed advantage over the BASIC09 version. For example, one of my data disks uses five directories and contains a total of 169 files. *Find* searched the entire disk in 28 seconds and displayed the locations of two specified files. This is over seven times faster than the three minutes and 32 seconds required by the BASIC09 version to perform the same job. Because of the way OS-9 stores file entries, faster speeds would be difficult to obtain.

Using *Find*

To locate a file (or files), type `find`, followed by the name of the file or subdirectory you want to find, and the name or pathlist of the directory where you want the search to start. If you can't remember the full filename or if you want to search for multiple files, just enter a part of the filename to be found. For example, the command line

```
find .bak /d1
```

tells OS-9 to search the entire disk in Drive 1, starting at the root directory, for any files containing the string `.bak` (which is the extension my word processor uses for backup files). For one of my data disks, OS-9 responds as shown in Figure 1. It is important to note that *Find* locates all file and directory names containing the search string regardless of the case of the characters you enter on the command line or the case of the characters in the actual filename.

Find accepts a `-p` option, which when entered immediately following find in the command line causes the program to display only the pathlists of the files found. (See Figure 2.) These pathlists can be used to feed other utilities via OS-9 pipes.

If you want to exit *Find* at any time during execution, press the space bar. *Find* is recursive; if you press BREAK instead, you may be left with one or more incarnations running as background tasks.

```
find.bak found in /D1/DOCS
dad891207.bak found in /D1/FAMILY
college_loan.bak found in /D1/SCHOOL/FINANCES
```

Figure 1: Sample Output From *Find*

The Program

When *Find* is executed, the directory is changed to the desired directory, which is then opened and read. Each filename is compared to the search string. If a match is found, the location message is displayed onscreen.

The attribute bytes of each entry are also read to see if the entry is a directory. If a subdirectory is found, *Find* re-executes itself using the new directory's pathlist with a null byte (0) added at the end to indicate it is a subdirectory. The subdirectory is then opened and searched in the same manner, running *Find* again for each lower level in the directory tree.

When a directory has been fully searched, the current incarnation of *Find* terminates and returns execution to its parent. The search continues until all files in the starting directory and lower-level directories have been examined.

While developing *Find*, I discovered

```
/D1/DOCS/find.bak
/D1/FAMILY/dad891207.bak
/D1/SCHOOL/FINANCES/college_loan.bak
```

Figure 2: Sample Output Using -p Option

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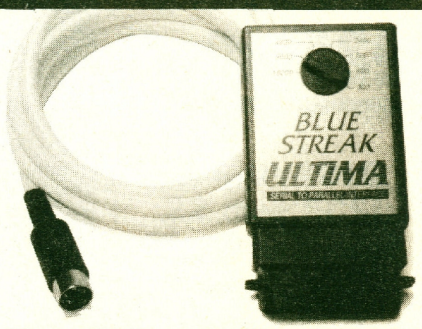

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that changing directories is the most time-consuming function in the program. To maximize speed, changes to subdirectories (flagged with a null byte) are made only by filename rather than by using the complete pathlist. Another time-saving feature is that the program changes directories in the forked process. Then when the child process terminates, the parent is automatically placed in its original directory, eliminating the need for a second change of directories.

Find can be a real time saver for those, like me, who can't remember where their files are located. I hope it is helpful to you, too.

Stephen Goldberg is a dentist and the author of the Utilipak *series of OS-9 utilities. He may be contacted at 695 Plainview Road, Bethpage, NY 11714. Please include an SASE when requesting a reply.*

CoCo 3

The Listing: Find.asm

```
*************************************************
*
* FIND  -  (c) 1989 by STEPHEN B. GOLDBERG
*
* Use: find [-p] <string> <start.directory>
*      -p = display only pathlists
*
* Descends directory tree and searches for file
* names or sub-directory names containing a match
* for the string.  Character case is ignored.
*
* Hit <SPACE> to exit the program.
*
         ifp1
         use   /dd/defs/os9defs
         endc
*
         mod   len,name,prgrm+objct,reent+1,entry,dsiz
*
flag     rmb   1              pathlist option flag
path     rmb   1              directory path number
dpath    rmb   1              disk path number
strsize  rmb   1              size of search string
attrbuf  rmb   1              file attribute buffer
entrysiz rmb   2              size of directory entry
strpoint rmb   2              pointer to search string
fullpath rmb   2              pointer to full pathlist
dirpoint rmb   2              pointer to directory name
nampoint rmb   2              pointer to filename buffer
ender    rmb   2              pointer to end of filename
descript rmb   4              descriptor logical sector number
buffer   rmb   200            parameter passing buffer
         rmb   200            stack
         rmb   200            parameters
dsiz     equ   .
*
name     fcs   /Find/
         fcb   3              edition number
         fcc   /(c)1989 S.B.Goldberg/
*
dot      fcs   /./            current directory
at       fcs   /@/            entire disk
*******************************
* INITIALIZE
*******************************
entry    decb                 parameters?
         lbeq  syntax         no, prompt and quit
         clr   entrysiz       zero msb entry size
         clr   strsize        zero search string size
         clr   flag           clear pathlist flag
         clr   3+descript     zero lsb descriptor position
         leay  buffer,u       parameter passing buffer
         lda   ,x+            parameter character
         cmpa  #'-            option?
         bne   nooption       no, save string pointer
         sta   ,y+            yes, save in buffer
         lda   ,x+            option character
         ora   #$20           make it lower case
         cmpa  #'p            is it p?
         lbne  syntax         no, prompt and quit
         inc   flag           set pathlist flag
         sta   ,y+            put option in buffer
findstr  lda   ,x+            next character
         cmpa  #$20           search string found?
         beq   findstr        not yet, keep looking
         blo   syntxerr       no parameters, prompt and quit
nooption leax  -1,x           string found, reset pointer
         stx   strpoint       save address of search string
sizeloop ldd   ,x+            get string character
         sta   ,y+            put in parameter passing buffer
         inc   strsize        count string character
         cmpb  #$20           end of string?
         bhi   sizeloop       no, move another character
         blo   syntxerr       no directory path, prompt and quit
         ora   #$80           set ms bit of last string character
         sta   -1,x           return to search string
         stb   ,y+            put space in buffer
spcloop  ldd   ,x+            next parameter character
         cmpb  #$20           directory parameter?
         beq   spcloop        not yet, look again
syntxerr lblo  syntax         no directory path, prompt and quit
         sty   fullpath       pointer to full pathlist
         sty   dirpoint       pointer to current directory name
pathloop ldd   ,x+            directory pathlist character
         cmpa  #'a            is it lower case?
         blo   saveit         no, save it
         cmpa  #'z            is it lower case?
         bhi   saveit         no, save it
         anda  #$df           yes, make it upper case
saveit   sta   ,y+            put in parameter passing buffer
         cmpb  #$20           end of pathlist?
         bls   setend         yes, terminate it
         cmpa  #'/            is character a slash?
         bne   pathloop       no, move another character
         sty   dirpoint       yes, reset directory name pointer
         bra   pathloop       move another character
setend   lda   #$0d           carriage return
         sta   ,y+            to end of pathlist
         sty   nampoint       save filename buffer pointer
         ldx   dirpoint       name pointer for sub-directories
         tstb                 is this a sub-directory?
         beq   change         yes, directory name only is much faster
         ldx   fullpath       use full path only for start directory
change   lda   #read.         read mode
         os9   i$chgdir       change directory
         lbcs  cant           prompt and quit with error
         ldx   nampoint       filename buffer pointer
         lda   #'/            slash to directory pathlist
         sta   -1,x           to extend the pathlist
         leax  dot,pcr        current directory (.)
         lda   #read.+dir.    read directory mode
         os9   i$open         open the directory
         lbcs  out            exit with error
         sta   path           save directory path number
         leax  at,pcr         entire disk
         os9   i$open         open disk
         lbcs  out            exit with error
         sta   dpath          save disk path number
*******************************
* LOOK FOR MATCHING FILENAME
*******************************
read     ldd   #ss.kysns      key sense function
         os9   i$getstt       check for key press
         tsta                 <SPACE>?
         lbmi  noerr          yes, exit program
         ldx   nampoint       filename buffer pointer
         ldy   #29            maximum filename size
         lda   path           directory path number
         os9   i$read         get filename
         lbcs  error          branch on error
         leax  descript,u     descriptor sector number buffer
         ldy   #3             three bytes
         os9   i$read         get logical sector number
         lbcs  out            exit with error
         ldx   nampoint       filename pointer
         lda   ,x             filename character
         anda  #$7f           clear ms bit
         cmpa  #'A            valid filename?
         blo   read           no, get next entry
         clr   1+entrysiz     zero entry size
lenloop  inc   1+entrysiz     count character
         lda   ,x+            last character?
         bpl   lenloop        no, count another
         anda  #$7f           yes, clear ms bit
         ldb   #$0d           carriage return
         std   -1,x           to end of filename
         stx   ender          save end address
         lda   1+entrysiz     get entry size
         suba  strsize        subtract search string size
         bmi   dirchk         skip compare, too short
cmploop  ldx   nampoint       filename pointer
         leax  a,x            offset for partial match
         ldy   strpoint       search string pointer
         ldb   strsize        search string size
         os9   f$cmpnam       compare strings
         bcc   showit         match, go display it
         deca                 done?
         bpl   cmploop        no, recheck
*******************************
* CHECK FOR SUB-DIRECTORY
*******************************
dirchk   pshs  u              save U register
         ldx   descript       ms bytes of descriptor position
         ldu   2+descript     ls bytes of descriptor position
         lda   dpath          disk path number
         os9   i$seek         find descriptor sector
         bcs   out            exit with error
         puls  u              retrieve U register
         ldy   #1             one byte
         leax  attrbuf,u      attribute buffer
         os9   i$read         get descriptor attribute byte
```

```
        bcs   out           exit with error
        tst   ,x            is this file a directory?
        bpl   read          if not, get next entry
*****************************
* FORK IF DIRECTORY FOUND
*****************************
        ldx   ender         end of sub-directory pathlist
        clra                flag to indicate sub-directory
        ldb   #$0d          carriage return terminator
        std   ,x            add flag to parameters to be passed
        leax  name,pcr      program name (Find)
        ldd   #$1101        type/lang and data size
        pshs  u             save U register
        leau  buffer,u      parameter passing buffer
        ldy   #200          maximum parameter length
        os9   f$fork        run Find again for the sub-directory
        bcs   out           exit with error
        puls  u             retrieve U register
        os9   f$wait        wait until done
        tstb                error passed?
        bne   out           yes, exit with error
        lbra  read          no, get next entry
*****************************
* DISPLAY MATCHING FILENAME
*****************************
showit  tst   flag          pathlist option?
        bne   pathonly      yes, pathlist only
        ldx   nampoint      filename pointer
        lda   #$0d          carriage return
        sta   -1,x          terminate directory pathlist
        ldy   entrysiz      size of filename
        bsr   print1        filename to screen
        leax  <foundin,pcr  found in message
        ldy   #foundlen     length of message
        bsr   print1        to screen
pathonly ldx  fullpath      full pathlist pointer
        bsr   print         pathlist to screen
        ldx   nampoint      filename pointer
        lda   #'/           slash
        sta   -1,x          re-extend pathlist
        bra   dirchk        check if directory
*
print   ldy   #200          maximum length
print1  lda   #1            standard output path
print2  os9   i$writln      to screen
        bcs   out           exit with error
        rts                 return
*****************************
* ERROR MESSAGES
*****************************
error   cmpb  #e$eof        end of file?
        bne   out           exit with other error
noerr   clrb                clear error flag
out     os9   f$exit        quit
*
cant    leax  <nodir,pcr    can't change message
        ldy   #nodirlen     length of message
        lda   #2            standard error path
        bsr   print2        message to screen
        ldx   fullpath      full pathlist pointer
        ldy   #200          maximum length
        bsr   print2        directory path to screen
        os9   f$perr        display error number
        bra   noerr         exit
syntax  leax  <sprompt,pcr  syntax prompt
        bsr   print         to screen
        bra   noerr         quit
*
foundin fcc   / found in /
foundlen equ  *-foundin
nodir   fcc   /**** Can't change directory to: /
sprompt fcb   7
nodirlen equ  *-nodir
        fcc   /Use: find [-p] <search_string> <start_directory>/
        fcb   $0a
        fcc   /     -p = display pathlists only/
        fcb   $0d
*
        emod
len     equ   *
        end
```


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Product Review

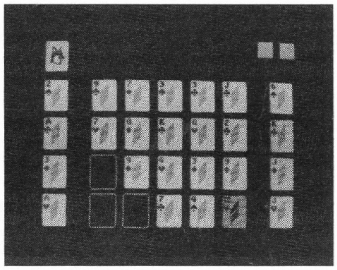
Duo Deck Solitaire: Two Decks Are Better Than One

Duo Deck Solitaire is a CoCo 3 package that consists of two different games of solitaire, each of which uses two decks of cards to play. Now, you might wonder why anyone would want to play solitaire on a computer when a real live, three-dimensional deck of cards is so readily available. Other than the mundane task of shuffling two decks and having more cards wind up on the floor and your lap, the computer is a stickler when it comes to playing by the rules and won't let you improvise, adjust or allow you to make any illegal moves. It *doesn't* let you cheat, is what it does.

Both games, *Windmill* and *Sly Fox*, require thought and strategy, although a bit of luck doesn't hurt. To win either game is about as easy as nailing Jell-O to a wall and as likely as having a centipede on crutches win the 100-yard dash in the Olympics.

Sly Fox

The object in *Sly Fox* is to build four

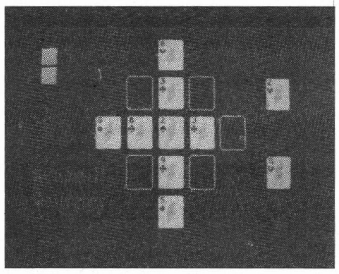


foundations of the same suit in ascending order (Ace to King) on the left side and to build another four foundations of the same suit in descending order (King to Ace) on the right side. In the middle are 20 storage, or waste, piles from which you can draw cards to place on the foundations. When play from the storage piles is no longer possible, you simply draw 20 new cards from the deck and place them on the storage piles, which may mean burying some that are still there. You repeat the previous step and use the new cards to build foundations.

Windmill

The object of *Windmill* is similar to *Sly Fox* in that you are building foundations. The thing to remember is that you can build only on the center square (the Ace foundation) or on the four squares between the arm (the King foundations). You may place cards from the deck on any empty square, but you cannot build on them. The Ace foundation (center pile) is built in ascending order (Ace to King), while the King foundations are built in descending order. You may place a card on a foundation at any time, but it cannot be taken consecutively from the same pile. For example: If your Ace foundation is up to 6 and a King foundation has all the cards from king to 7, you cannot play the 7, 8, 9, etc., from that pile — just the first card. Thus you may take the 7 but must look elsewhere for the 8.

The rules may seem a bit confusing at first but aren't all that bad once play begins. Besides, the games will emit a beep and not allow you to make illegal moves. Plus, you can always view the rules, onscreen, any time during play by pressing the question mark (?).



All options are selected using an onscreen pointer that is operated by mouse or joystick. Simply move the pointer to the card you want to move and click the button. This highlights the card. Then move the pointer to the spot where you want to move the card and click the button again. One note of caution: The program does *not* support a Hi-Res interface. Those who are using one must unplug the interface in order for the joystick or mouse to work properly.

The graphics for this CoCo 3-only program are good and play is smooth. The games are stimulating, challenging and fun to play, although hard to win. The only thing lacking is a score. It would be nice to be able to see, via a score or points, whether a certain strategy produces better results than another or just to see if you can better a previous score.

For those who enjoy solitaire but are looking for something more challenging than just flipping cards over, *Duo Deck Solitaire* is a must. (*Eversoft Games, Ltd., P.O. Box 3354, Arlington, WA 98223-3354, 206-653-5263; $19.95 plus $2.50 S/H.*)

— George Aftamonow

When BASIC on the Color Computer encounters a `GOSUB` or `GOTO` statement, it first compares the target line number with the current line number. If the target line number is higher, BASIC begins its search for the subroutine at the current position. If the target line number is lower, however, the search starts from the beginning of the program.

To increase the speed of your programs, put subroutines as close to the beginning as possible. Use a `GOTO` in front of them, pointing to where the program should normally start so the subroutines are bypassed when you run the program. A further speed increase can be seen if you put the subroutines in decreasing order of the frequency of their use (i.e., most-used subroutines first).

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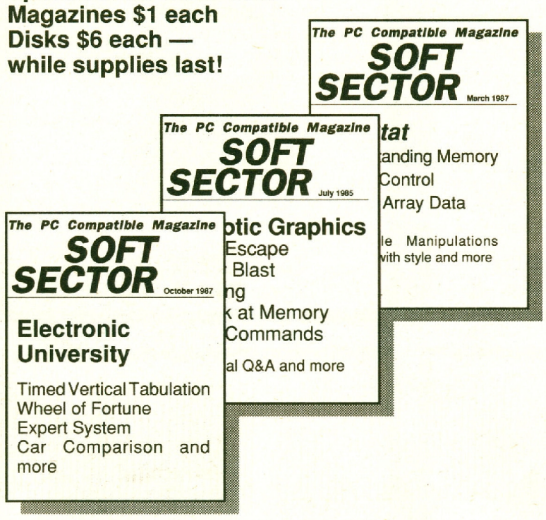

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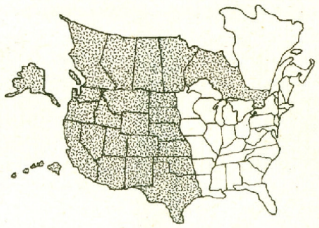

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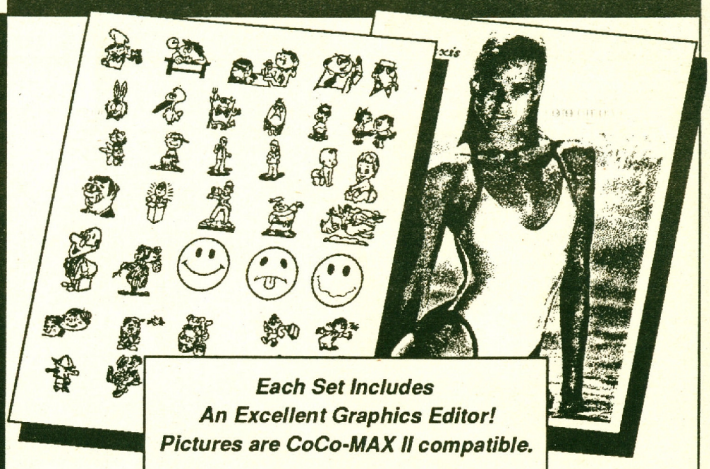

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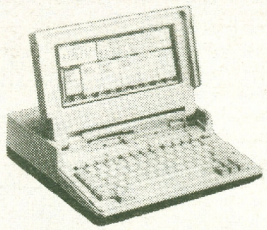

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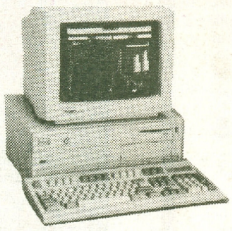

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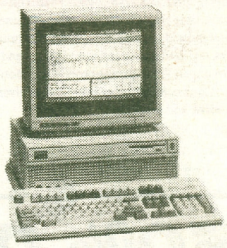

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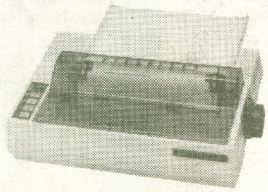

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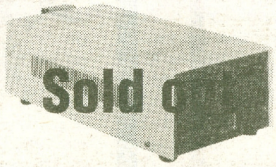

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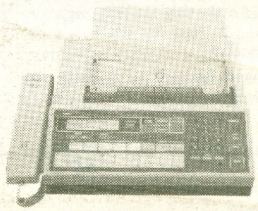

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